PUBLICATION OFFICES

168-177 POTTER BUILDING, NEW YORK.

Telephone Call: Murray 586. Cable Address: "Electrical," New York.

W. J. JOHNSTON, Editor and Publisher.

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New Advertisements.

In the growth of THE ELECTRICAL WORLD in circulation, size and general improvement, the value of its columns for reaching those engaged in electrical pursuits or interested in electrical matters has not failed to be appreciated by advertisers. Readers will find it to their advantage to keep their eyes on the advertising as well as the reading columns. The following are the new advertisements in this issue:

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VOL. X. NEW YORK, OCTOBER 15, 1887. No. 16.

IT is said that the working of the sixpenny or 12 cent telegram system in England shows that cheap telegraphy there is done at the expense of the taxpayer. Here the Western Union Company avows itself to be satisfied with the current rates, which are practically the same as the English, but to pay better dividends its tariff must undergo, one would think, a little toning up.

THE London *Electrician* has been greatly impressed with the practical good accomplished in this country by the National Electric Light Association, and wants to see something similar attempted in England. It suggests a number of good men for an executive committee, and advises a discussion of the subject. England does not, as yet, offer much material for such an association, but there is certainly enough for a good beginning.

IT cannot be denied that the first reports of the audible inductive effects at a thousand feet distance seemed rather dubious, but they are now more than confirmed by the recent experiments of Mr. Wm. H. Preece, who has shown that with an induced length of conductor of 1 mile, and with a current of 1 ampère, inductive effects are audible at a distance of 1.9 mile. He also gives a formula for calculating the limiting distance of audibility, from which can be adduced the strength of current required to obtain an audible indication in the telephone. This extreme sensitiveness explains the ease with which the train induction telegraph can be operated.

THE Earl of Rosebery, speaking before the International Shorthand Congress, described the telegraph, the telephone, the postal card and shorthand as nothing but the signals of distress of an over-strained civilization. This is an odd way of stating it and would have been clearer had he referred more specifically to the overstrained operator. Still, life seems very short and art or industry very long in a big country such as this, with scant population and nearly all its material resources undeveloped; and to make the most of time one must perforce employ these "signals of distress." After all, these conveniences are all in the direction of relief, and will, in time, be supplemented by many other methods of saving hands, brains and hours.

MR. GEO. B. PRESCOTT, JR., drew attention last week, in his article on the Marshall condenser, to the fact that the time has arrived when American genius should apply itself to the construction of standard electrical instruments of precision which are now for the most part imported from abroad. This is a very good suggestion, and one which, if acted upon, will certainly repay any worker in this field. The single improvement which he describes is but one of many which might be made, and we know that others are at work to improve standard electrical instruments, and the results already obtained are most gratifying. While we are not behind in so far as practical measuring apparatus for ordinary work is concerned, there is still a great deal to be done in the finer grades of apparatus.

THE well-known oxidizing power of ozone has already been utilized in hygienic work for the purification of the atmosphere of hospitals and sick rooms, and with eminent success. Hence we are not astonished to read that a Frenchman, M. Stoffel, proposes to purify river water by the same medium. The gist of the process is that the ozone generated by the electrolytic decomposition of the water kills the minute organisms and oxidizes all organic substances, at the same time precipitating the carbonates in course of dissolution, thus effectually purifying the water. The greatest drawback is the expense of the process, which amounts to two cents per one cubic meter of water, but M. Stoffel thinks that this could be materially reduced by the sale of the by-products obtained in the process. While this application of electricity to the purification of water seems promising it can hardly be called new, as it has already been suggested, though no active steps, so far as we are aware, have been taken to carry it into practice. The only precaution which would be necessary in applying the process is the separation of the hydrogen gas developed during the electrolysis of the water. By allowing it to mingle with the oxygen developed, it is liable to accumulate and form an explosive mixture. We might add that the forcing of air into water mains has recently been introduced with the same object in view, and with good success.

A NOTABLE point dwelt on by Mr. Lockwood at Pittsburgh, in which he was seconded by others, is the fact that competent men are required as much in the telephone as in the telegraph service. While the early defects in the latter are plainly traceable to lack of trained electricians generally, for the reason that these had to be created, no such excuse exists to-day, and the time will come when every telephone company will have its electrical staff similar to that of the telegraph companies. We remember that in the early days of the telephone it was considered advisable that only men of some training should take care of telephonic apparatus, and numbers of our college graduates found places in the service. But because under their care the service was kept in tolerably good condition it was supposed that the work was such as not to require a high degree of intelligence, and consequently "cheaper" men were employed later on, with the results manifest in many cases to-day. We are glad, therefore, to note that the sentiment is gaining that good men should be attracted to the service by adequate remuneration, and indeed only in this way can the desired result be brought about. As Mr. Lockwood puts it, telephone companies both in the selection of their employés and of apparatus must "distinguish between the words 'economy' and 'parsimony,'" and learn "that a dollar properly expended to-day means a good many saved throughout the year."

A VERY happy and effective piece of work has been done by the Brush Electric Company, of Cleveland, in the issuance of a neat pamphlet on the value of the electric light for street illumination. This pamphlet is a compilation of the opinions of the police officers of the United States, addressed to Mr. W. S. Frear, the secretary of the Brush Company at Buffalo. No fewer than fifty-six opinions are given, and they are without exception most emphatic in their praise of the light as an aid to the police in the performance of very onerous duties. One officer regards "each of the large lights as being equal to the services of a policeman at the particular place where it is situated." Another reports a falling off in crime to the extent of 25 per cent. since the introduction of the light. A third is "convinced that electric lights are a help to officers in the performance of police duty to an extent that cannot well be estimated." The view of one Chief of Police is that "it is the only light and should be adopted by all cities." At Scranton, the time is hoped for "when every street and alley in the city will be illuminated by electric lights." Mr. Cyrus Small, Superintendent of Police of Boston, holds "that the lighting of public highways by electricity is of incalculable aid to the police," and he points out that groups of disorderly people are now found very rarely at night. In Jersey City, crime in the "tough" neighborhood has been reduced one-half. And so the story goes, being throughout a confirmation of the views expressed but lately by Mayor Hewitt in respect to the better lighting of New York.

WHEN Professor Henry showed the remarkable distance at which electric inductive action could be indicated by the effect of one coil upon another situated in different parts of a house, and the inductive effect of a lightning discharge, he little dreamed that the same principle would some day be employed for the purpose of maintaining communication with a rapidly moving train. Yet such is the case, and the demonstration which we recently witnessed ourselves once again, and describe in another column, can leave no doubt that the system has been reduced to a practical basis. The operator on board the train was "rushed," perhaps harder than one in any stationary telegragh office, and the remarkably few repetitions required demonstrated fully the volume and clearness of the sound received in the telephone, both at the terminal station and on the car. With success demonstrated, the question will naturally be asked whether the system will find extensive application. We believe that, in the matter of its introduction, it will follow very much the course of the speaking telephone. When first brought out the mere possibility of its function was doubted. When finally demonstrated as an actual fact, it was looked upon much as a toy which might be used for certain purposes. After that, with very little delay, came the education of the public to the conveniences it afforded, making it the unparalleled success which it is to-day. So, we believe, it will be with the train telegraph. Its practicability is proved beyond question, and when the public, in which is included the railroad managers, become educated to its advantages, it will take a prominent place among the methods of communication. It certainly affords advantages which could not be obtained so cheaply in any other way, so far as the movement of trains is concerned, and as a convenience to the travelling public it stands unique.

IT is impossible not to witness with regret the sale of the Baltimore & Ohio telegraph system to the Western Union Company. Not only is the system old and historic, but for the last three years it has been the chief pride and hope of those who wished to see vigorous competition maintained in the telegraphic field. Elsewhere in our columns will be found the details of the negotiations by which the transfer has been accomplished. The whole arrangement hinges on the condition and prospects of the Baltimore & Ohio Railroad Company, which has of late been the subject of unlimited newspaper comment, and which was evidently in great need of pecuniary assistance. By one reliable authority, the indebtedness of the telegraph system to the railroad was placed last year at the sum of $3,872,693, and this was one of the burdens, it would appear, that drove the railroad corporation into the arms of the banking syndicate which stood ready to advance $10,000,000 to meet all emergencies. No sooner was this loan announced than it was realized that the control of the Baltimore & Ohio telegraph system by its great opponent was at hand, and hence the events of the last few days have not been a great surprise. One singular feature of the affair, however, is the attitude of Mr. Garrett, since his return, in declaring that the sale will not have his consent and that he proposes to dispute it. The sale has every sign of validity, but if Mr. Garrett can show reasons for annuling it, the public will be interested to know at once what they are. Other questions press for notice, however, chief among them being the settlement of the cable war. This settlement is believed in many quarters to be not far off, and it is thought that a rate of 40 cents will be established. Another question is as to the rates for land service, but doubt on that point has been met by the statement that no general advance is intended. Yet, it is clear that a few cents added to the present tariff would yield a handsome income, and the temptation to exact that revenue may prove stronger than the desire to conciliate public opinion. As for the staff of the Baltimore & Ohio system, it is to be feared that they will, in many instances, bear the brunt of the change, in spite of the fact that they have spared no effort in the discharge of their daily duty. This is one of the most discouraging aspects of the whole matter, and is one of those considerations that lead some persons to believe that the nearer the telegraph service approaches an absolute monopoly the nearer it is to becoming a department of the public service, in which those who render years of honest and intelligent service are to be adequately recognized and protected under the rules of civil service reform.

THE AMERICAN INSTITUTE ELECTRICAL EXHIBITION.

The exhibits at the Electrical Exhibition are now nearly all in position, and they give collectively a very good idea of recent progress in electrical applications. We propose to make notes from week to week of the various displays in detail. It may be mentioned here that the exhibition of electric motors is, by far, the finest, most complete, and most extensive ever made, and that it has already become a source of much curiosity, interest and instruction to the crowds who throng the building daily. The historical exhibit also assumes considerable importance, and includes in all probably 200 articles, large and small, contributed by several gentlemen and scientific institutions. Below are some preliminary notes.

WASHBURN & MOEN MANUFACTURING COMPANY.

The exhibit of the electric wire industry is very complete. The visitor is at once attracted by a beautiful showcase, 15 feet high, in which the Washburn & Moen Manufacturing Company have arranged a complete exhibit of their various sizes and qualities of iron and copper wire.

MESSRS. HOLMES, BOOTH & HAYDEN'S

exhibit of insulated wires includes their "K. K." insulated iron and steel wire, magnet wire, insulated hard-drawn copper wire for municipal electric lighting, damp-proof office wire, etc.

THE OKONITE COMPANY

show a large variety of their products in telegraph and telephone wires and cables, the "Candee" aerial cable, okonite insulated wire, braided and plain covering, and armored cables for electric light, telegraph and telephone cables.

THE NEW YORK INSULATED WIRE COMPANY.

This company shows the Grimshaw insulated wires and cables, and the Grimshaw tapes for all electrical uses.

THE SCOVILL MANUFACTURING COMPANY

show their Scovill-Cowles silicon bronze wire, having high tensile strength and low resistance. Among the samples are several pieces of wire having a core of silicon bronze surrounded by a layer of pure copper, thus combining strength with great conductivity. In this exhibit also are German silver wires adapted for high resistance coils and having a low temperature coefficient. Electric light fittings in brass, copper and zinc, also products of the same company, are shown in considerable variety.

THE ELEKTRON MANUFACTURING COMPANY

have an exhibit which illustrates in a marked degree the progress that has been made in the application of electricity to medical apparatus. The company's specialty is the chloride of silver battery, which is here shown in a new form, made in various groups of 50 cells, 32 cells and 24 cells, ready for work, and intended to last for at least two years. The 50-cell test battery here shown is a fine instrument. The company exhibit also physicians' milliampèremeters ranging up to 25 and 50 milliampères, with multiplying switch. The exhibit includes further a chloride of silver battery, gotten up in very convenient form for domestic use, and the company propose to demonstrate its capabilities in bell ringing, burglar alarm and other work.

KERITE.

Day's "Kerite" exhibit, made by Mr. Clark B. Hotchkiss, is a fine display, and includes almost every conceivable application of insulated wire to electrical purposes. All sizes of aerial, underground and submarine cables for telephone, telegraph and electric light work are shown, among others being a torpedo cable made for the Russian government.

BISHOP GUTTA PERCHA WORKS.

The Bishop Gutta Percha Company show the varied application of gutta percha for insulating wires, and exhibit the same material in sheets for electrical work generally. Gutta percha acid bottles and jugs are also shown in several sizes.

THE JEROME KIDDER MANUFACTURING COMPANY.

This exhibit of electro-medical apparatus includes in large variety the fine electrical instruments and apparatus used by physicians, for which the company is so well known.

MESSRS. WILSON & HARD

also exhibit an interesting variety of physicians' electric apparatus, including a most complete and ornamental physician's cabinet, introducing a number of new and ingenious features.

JAS. W. QUEEN & COMPANY.

Messrs. Jas. W. Queen & Company show a number of new Toepler-Holtz electrical machines for scientific and medical purposes. Their other exhibits, which attract considerable attention, include reading telescopes, coils for galvanometers; Sir Wm. Thomson's reflecting galvanometer; Carpentier's spring ammeters and voltmeters; speed counters, meter bridges, milliampèremeters, tachometers, Wheatstone bridge and double key, differential galvanometers, supports for ammeters and voltmeters, a new form of English Post Office pattern resistance coils, a resistance box of 1 ohm with 4 subdivisions, a 16 c. p. gas burner, a mercury commutator, a sensitive galvanometer with bell form magnet suspended from silk with indicator, a rheostat graduated in new legal ohms, a universal rheometer for measuring the resistance of solid and fluid conductors; together with a number of other instruments frequently used by the electrician.

NEW HAVEN CLOCK COMPANY.

In one of the alcoves is situated the exhibit of the New Haven Clock Company, whose exhibit includes electric bells, house and hotel annunciators, burglar alarms and telegraph instruments. The company also exhibit the Porter electric messenger system. The instrument at the central office has an indicating dial 20 inches in diameter, and contains the numbers corresponding to the rooms of the house or hotel. The hand points to the number of the

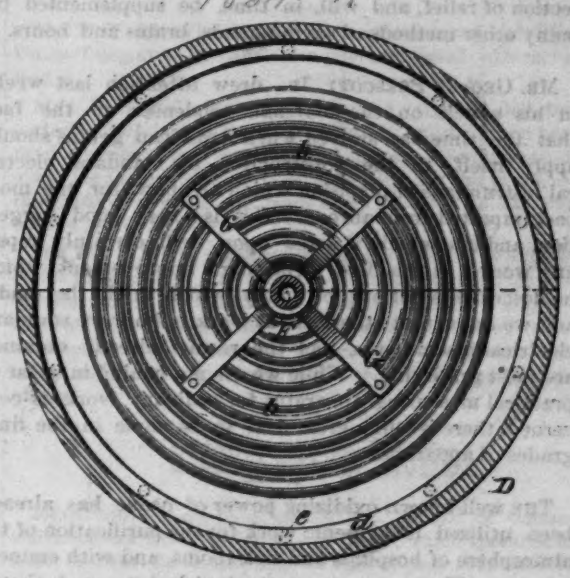


FIG. 1.—NEW FIRE DAMP INDICATOR.

room from which the message is sent. Through an opening at the top of the dial appears the message from the occupant of the room in question and a pointer turns to the number of the room. The pointer and message remain fixed until released by the person in charge. Drops at the lower part of the dial indicate the rooms numbered for each 100, the pointer on the dial indicating the intermediate numbers. Thus if drop No. 2 falls and the pointer traces to 32, the number of the room calling is 232. Any number of drops may be used from 1 to 5, making the apparatus applicable for 600 rooms. The rooms are provided with a circular call-box, on the dial of which are printed the names of 20 or more "wants," such as are usually required by the guests.

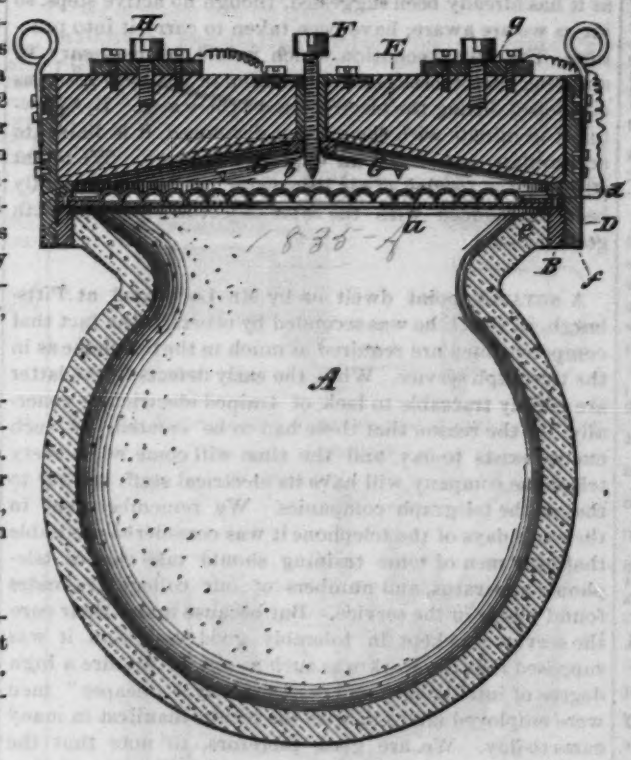


FIG. 2.—NEW FIRE DAMP INDICATOR.

Electric Fire-Damp Indicator.

It is a well-known fact that gases, such, for instance, as that termed "fire-damp," which are lighter than atmospheric air seek to intermingle with the air when separated therefrom by a porous wall. It is also an established fact that lighter gases pass through such porous walls much more rapidly than air or dense gases. In utilizing this property, Mr. August Berghausen, of Elberfeld, Germany, makes use of a vessel which normally contains atmospheric air, but which, when approached by a lighter gas, such as a fire-damp, becomes filled with a mixture of that gas with air. The gas, being the least dense, enters the porous cup more rapidly than the air leaves the same, and for a time, therefore, pressure is generated within the cup which is utilized for moving a membrane and establishing an electric circuit to sound an alarm.

The apparatus which is shown in plan and in section in the accompanying illustrations, Figs. 1 and 2, consists of a porous vessel *A*, to which is hermetically sealed the brass ring *B*. A copper or brass shell *D* is screwed on the ring *B*, and is provided with a flange *d*, below which is the perforated plate *a* which supports the corrugated diaphragm *b*. The cover *E* is made of porcelain or other non-conducting material.

The contact screw *F* passes through the cover *E* and through the contact-jaws *G*, and its lower end is extended near to, but does not normally touch, the membrane *b*. The contact jaws *G* are carried by the cover *E*, and their points are arranged on a plane with the end of screw *F*, and so adjusted that they may be moved with the screw *F*. The membrane *b* is in electrical connection with the post *g*, and the latter is in connection with a battery. The contact-screw *F* and jaws *G* are in electrical connection with the post *H*. The post *H* is also connected with the battery, and a suitably arranged bell or annunciator is placed in the circuit at the desired station.

The apparatus operates as follows: The detector being suspended in a mine near the roof, if a gas lighter than air, such as fire-damp, is generated in the mine, it instantly enters the porous cup *A*, the air leaving the cup at the same time; but as the gas enters faster than the air leaves the cup, pressure is for a time generated within the cup. This pressure acts against the membrane *b* and causes the same to rise against the screw *F* or jaws *G*, thereby closing the circuit and causing the bell at the end of the line to be sounded, thus automatically notifying the attendant of the presence of fire-damp in the mine.

The apparatus can also be used as a fire-alarm, the lighter heated air producing pressure in the cup while displacing the normal denser cool air in the same.

English and American Rapid Telegraphy.

To the Editor of The Electrical World:

SIR: Reading in your issue for Oct. 8 the paper on "Fast Telegraphy," by W. H. Preece, carried me back to the dead past, into a loft on Ann street and a telegraph operating room and offices on the corner of Cortlandt street and Broadway, New York. The latter place occupied by the American Rapid Telegraph Company, and the aforesaid loft by its own workshops, where its "apparatus was made," where "mechanicians of the highest skill (were) employed," "where standard gauges were worked up to, and where the most rigid system of inspection (was) exercised."

The Colts Arms Company made perforators for the company, which punched a strip of paper with holes, "so as to regulate the number, order, and rate at which alternate currents of electricity (were) sent along a wire by the transmitter," which sent "along the line those currents which at the distant end (were) recorded as words in the form of dots and dashes, replacing the slow and uncertain manipulation of the hand."

The receiver also "was a chemical writer of extreme sensitiveness, durability and great rapidity, recording the words in the Morse character."

The transmitters, receivers and other apparatus were made in the Ann street loft, only the perforators being made elsewhere. There too was made after plans furnished by Mr. Gerrit Smith a repeater which had "practically no time constant, which responded to exceedingly delicate currents and which made perfect electrical contacts"—actually recording by tests I saw made by Mr. Smith *twelve hundred words per minute.*

At the operating room the transmitters and receivers were operated by hand, being supplied with "governors" that controlled "the waste of paper" and prevented any possibility of, at one moment "having to record at 400 words per minute and the next at 25 when working by hand."

If "the use of condensers" really marked an "epoch in the evolution of telegraphy as eventful as the introduction of duplex working or of the telephone," then it is a question whether the credit of its introduction in fast telegraphy is not due to Mr. Gerrit Smith and Mr. Theo. F. Taylor, who used it with wonderful benefit in the "Rapid" system.

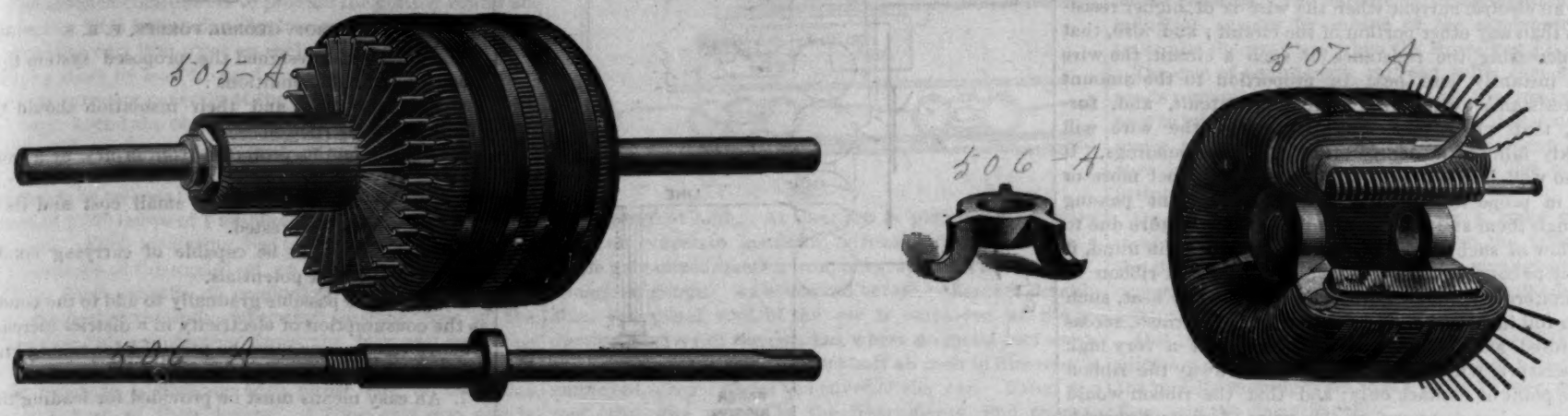
The "Rapid" system was that of Theo. M. Foote and Frank Anderson, and its regular speed between New York and Boston in 1880 to 1883 was 400 and 700 words per minute.

Without intending to copy M. Preece's article, I find my pages are made up largely of quotations which fit so nicely that it really seems as though there was little new in Mr. Preece's paper to some people, except that across the water they are just doing what was thought so little of in this country only a few years ago, that the whole apparatus and system probably is now consigned to regions whence they originated—a loft. H. ANDERSON.

PEEKSKILL, N. Y.

Improved C. and C. Motor at the Electrical Exhibition.

At the American Institute Electrical Exhibition the C. and C. Motor Company show a motor the construction of which is somewhat different from that of their machine employed in driving sewing machines. In the latter form, it will be remembered, the commutator is a flat one, lying in a plane at right angles to the shaft. The shaft passes through a wooden core held securely within the armature. In the new construction the usual form of cylindrical commutator is employed, as shown in Fig. 1. The other details of the armature are also interesting. The core consists of a series of semi-circular pieces of iron hinged together, as shown in the section, Fig. 3, upon



FIGS. 1, 2, 3 AND 4.—NEW C. & C. MOTOR.—ARMATURE.

which the sections, previously wound, are slipped. Two brass spiders of the form shown in Fig. 3 are then put in place and the armature is slipped over the shaft shown in Fig. 4. It will be noticed that the latter is turned with a collar and that the diameter of the shaft is greater for a short distance than at either end. The end of the enlarged portion of the shaft is screw threaded. It will also be noted that the hub of one of the spiders is sufficiently large to encircle the enlarged portion of the shaft, while the other is threaded to conform with the threaded portion of the same. Hence when the latter is screwed up, the smooth spider is forced against the collar and the action of the thread upon the other is to draw both spiders together so that they firmly grip the armature ring. The armature is thus rigidly and securely

FIG. 5.—MOTOR AND VENTILATING FAN.

held central upon the shaft without the use of a key or binding screw, and the spiders permit of ventilation in the interior of the ring.

Our illustrations, Figs. 5 and 6, show the motor complete driving a ventilating fan.

The Great Telegraph Sale.

A result long looked for has at last been reached, and the Baltimore & Ohio Telegraph property has passed into the hands of the Western Union Company. The terms of the sale are understood to be $5,000,000 in Western Union stock and $60,000 for fifty years for the telegraph service of the Baltimore & Ohio Railroad. Upon this basis the whole of the Baltimore & Ohio telegraph system has been handed over, and it is now being carried on for the account of the Western Union Company.

As our readers are already aware, this action is the result of the negotiations by which a loan of $10,000,000 was made to the Baltimore & Ohio railroad by an influential syndicate of American and European bankers. The railroad has thus disposed of its telegraph and express systems, and will, it is believed, shortly get rid of its sleeping car system also, thus leaving the railroad property free of drains and embarrassments.

The system which has changed hands in this remarkable way has had an existence of nearly fifty years, and it was over lines running along the Baltimore & Ohio road from Washington to Baltimore that Prof. Morse transmitted his first messages. The service was gradually extended, and grew to a mileage of 15,000 miles in 1884. At this time, Mr. Robert Garrett made up his mind to develop the system actively, and with that object in view secured Mr. D. H. Bates to manage the company. Mr. Bates summoned to his aid such men as Mr. J. E. Zeublin, Mr. E. A. Leslie, Mr. W. Maver, Jr., and others, and soon organized a fine corps and built up a good service. The progress of the company was attended by numerous law suits, as to right of way, etc., in most of which it was successful, and by a very general rate cutting, which had the effect of wiping out the Western Union dividend.

The last report of the Baltimore & Ohio Company showed 61,919 miles of wire, 8,353 miles of poles, and 1,300 offices. At the present time of transfer it probably has nearly 2,000 offices and 3,000 employés scattered over a system extending from Portland, Me., to Galveston, Tex., and westward to St. Louis and other leading centres. But in building up this system, large sums of money were necessarily expended, and the financial difficulties of the railroad company at last brought about the crisis that is now the one topic in Wall street.

At the time of the transfer, Mr. Robert Garrett was on his way to this country by the steamer "Ems," and it is understood that since his return he has objected very forcibly to the arrangement, going so far as to threaten fight. It is claimed, however, that the sale is closed with all due legality and cannot be set aside. Possibly some fights in the courts will attend the consummation of the "deal."

This sale leaves in the field but one competitor with the Western Union Company, namely, the Postal Company. It is asserted in some quarters that an understanding exists already between Mr. Gould and those interested in the Postal system, but on the other hand, the officers of the latter say that the removal of the rate-cutting Baltimore & Ohio betters their chances and prospects very materially. The Commercial Cable Company may be said to regard the matter in much the same light. The effect on the cable war remains somewhat uncertain.

The usual sequel to a telegraph combination has been an advance in rates. It is said, however, that such will not be the case, except in a few extreme instances. The existing rates are alleged to be generally and fairly satisfactory. This remains to be seen. The price of Western Union stock has not been greatly affected by the purchase, keeping pretty close to 80.

Electric Communication with Lightships.

The report of the committee appointed by the British Board of Trade to inquire into the desirability of establishing electric communication between lightships and the shore has just appeared. The evidence went to demonstrate in a most conclusive manner that the value and efficiency of the life-boat service would be vastly increased by the establishment of electric communication. Numerous cases were quoted in which vessels have been wrecked within sight of the lightship, while the weather has been so thick that much valuable time—sometimes many hours—has been lost before the attention of the life-boat station could be attracted. In other cases where lightships are stationed not far apart, the difficulty of telling from which ship the sound of the signal guns proceeded has taken the life-boat in the wrong direction and led to loss of life. All this would clearly be prevented if the lightship were electrically connected with the shore, Nevertheless, the committee report that this is "not desirable" on account of the expense, though they recommend that the experiments which have been carried out during the last three years between the town of Walton and the "Sunk" lightship off the Naze should be continued for another eighteen months. It should be explained that the object of the committee is to endeavor to arrive at the most economical system for general adoption, which, notwithstanding the wording of the report, they fully recognize to be eminently desirable. The experiments at the Naze, although perfectly sucessful electrically, have yet so far proved extremely costly. The experience obtained has shown that the telephone is the most suitable instrument for maintaining communication. With a receiver at each ear no difficulty is experienced in hearing even in the loudest gale. The length of cable employed is nine knots with an earth return. Daily electrical tests were made showing an insulation resistance in winter of 1,519 megohms, and 172 megohms in the summer. The resistance of the copper conductor was 0.77 ohm in the winter and 0.81 ohm in the summer. The inductive capacity was about 3.2 microfarads. The temperature of the sea bottom was in winter 44 deg. F., and in summer 62.5 deg. F. The work was carried out by the Telegraph Construction and Maintenance Company, who have devoted much energy and attention to overcoming the mechanical and electrical difficulty of connecting the ship so as to permit of perfect freedom of motion without danger of fouling the cable.

Commercial Cable Figures.

The growth of the business of the Commercial Cable Company (Mackay-Bennett cables), says the New York *Herald*, has lost none of the impetus given by the reduction of the rate from 25 cents to 12 cents a word. For

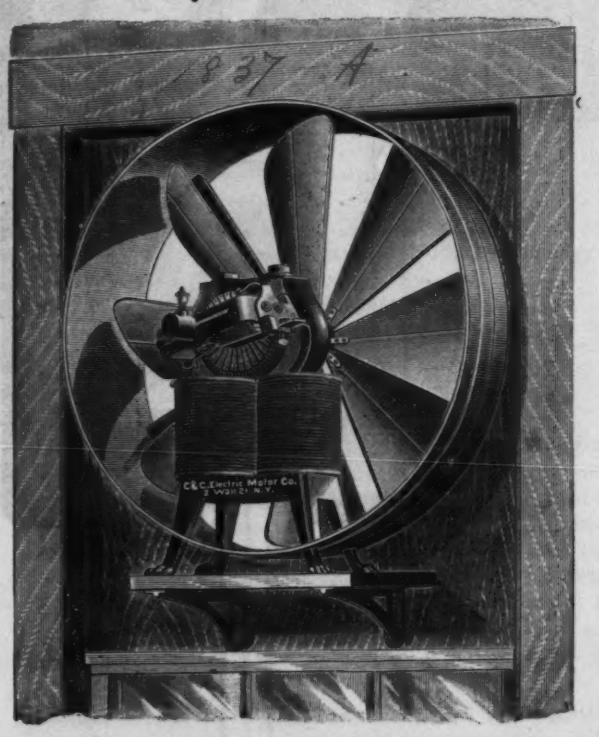


FIG. 6.—MOTOR AND VENTILATING FAN.

the week ending Oct. 2 the increase in the number of messages sent over the last week of the 25-cent rate—Sept. 7 to Sept. 13—amounted to 161.07 per cent., and every day of the week showed a growth from the day before.

"I am greatly tempted," said General Manager Ward, Saturday, "to tell you what our figures are, but I think it would perhaps be unwise to let the enemy, the pooled lines, know. It is sufficient to say that we are doing vastly more business than ever before, and that the reduction in rates has proved successful far beyond our expectations. We have got to-day all the customers we ever had, and new ones are coming in by scores daily.

"And I think we deserve it all," Mr. Ward added, "for we give our patrons their money's worth. They appreciate our service, and I am sure that were you to go among them and ask why they prefer the Commercial cable they would give you the most substantial reasons. My own claims for our company are these: 1st, it is contending against monopoly and high tariff; 2d. It has the shortest

and most direct routes between the United States and Europe; 3d. It avoids the long land lines of Newfoundland, Nova Scotia and Ireland; 4th. It is the only company operating an Atlantic cable right in New York City; 5th. It is the 'all cable' route to England and France; 6th. It has all the best appliances and a first-class force of operators; 7th. It is the quickest and most reliable. Here are reasons for every day in the week, and they are good ones."

Irish's Phontograph, or Electro-Thermal Recording Telephone.

It is well known that a fine platinum or other wire may be made incandescent or red hot by the passage through it of an electric current when the wire is of higher resistance than any other portion of the circuit; and, also, that on increasing the resistance of such a circuit, the wire will instantly lose heat in proportion to the amount of resistance introduced into the circuit, and, further, that when the circuit is broken, the wire will quickly fall to the temperature of its surroundings. It is also well known that certain metals contract more or less in proportion to the amount of current passing through them and the rise and fall of temperature due to the flow of such current. Bearing these facts in mind, it is easy to conceive that the result of passing a ribbon of any material which is more or less affected by heat, such as tin foil insulated with a thin coating of varnish, across a pointed loop of platinum maintained at a very high temperature, will be to destroy or burn away the ribbon at the point of contact only; and that the ribbon would be more or less destroyed at the point of contact according to the heat and form of the loop and its force and pressure against the ribbon. A simple apparatus devised for the employment of these effects to the transmission, reproduction and recording of articulate and other sounds, has recently been devised by Mr. W. E. Irish, of Cleveland, O., and the transmitting apparatus employed is shown in the accompanying illustrations, Figs. 1 and 2,

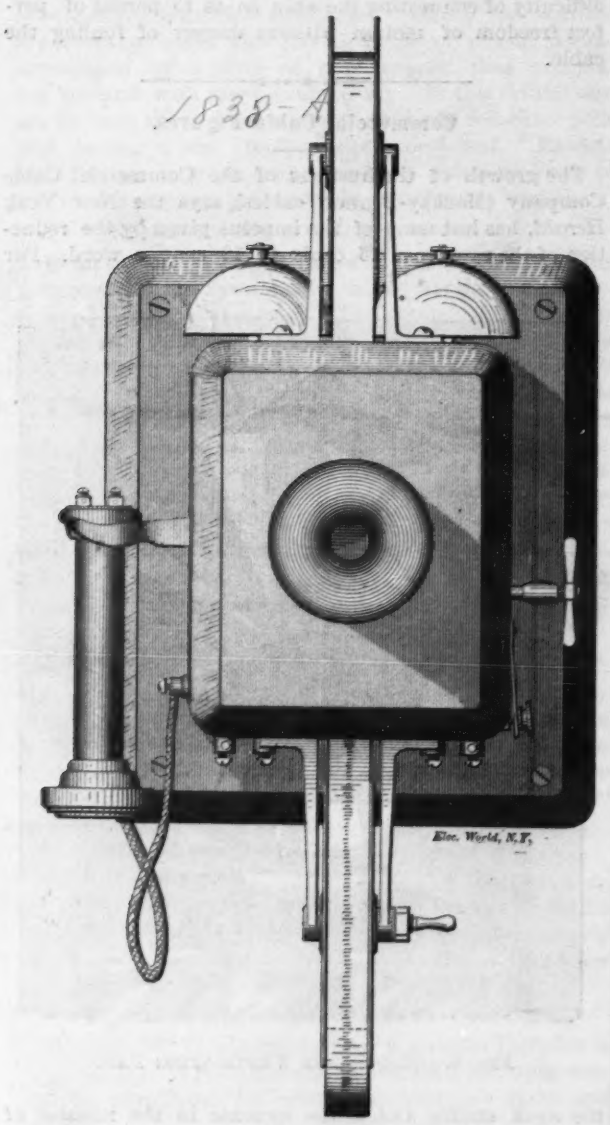


Fig. 1.—Irish's Phontograph.

in elevation and side view. The diagram, Fig. 3, shows the details of the instrument.

In the centre, at the back of an adjustable diaphragm rests a wedge-shaped piece of platinum wire supported by two springs and resting with the thick end of the wedge against the centre of the diaphragm, while the point is directed inwards and lightly touches the ribbon in which the message is to be perforated. The ribbon behind the point passes over a drum which is recessed circumferentially in its centre so as to offer no obstruction to the passage through the ribbon of the heated platinum point. This platinum point perforates the ribbon more or less according to its degree of heat, its shape and size, and the intensity of sound actuating the diaphragm. The louder or higher the pitch of the sound the deeper will be the penetration of the platinum point hrough the ribbon and the larger in proportion will be the perforations. The perforated ribbon as it leaves the recessed drum is drawn between two other drums connected respectively to the line and one pole of the battery employed for transmitting; the other pole being to ground, as shown in Fig. 3. The transmitting or last two mentioned drums, are encircled by an elastic, non-conducting material made adhesive on the outer surface so as to hold the carbon powder with which they are served.

The inventor has also employed with advantage, in lieu of the elastic covered carbon rollers, a vessel or funnel

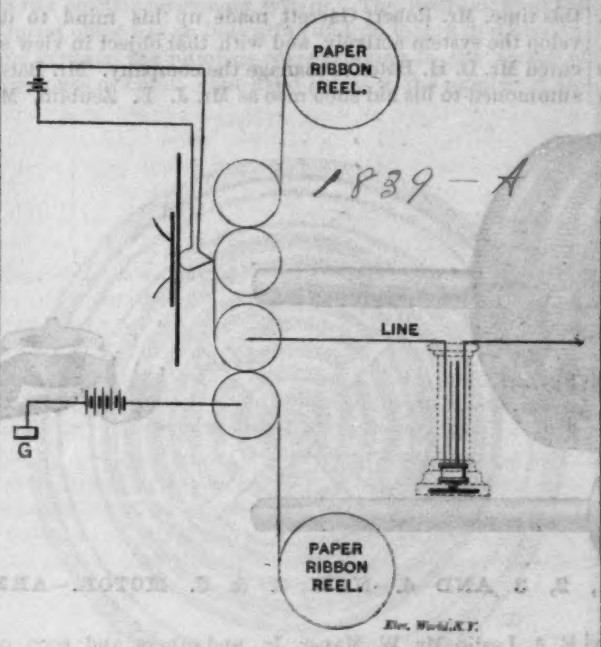


Fig. 3.—Irish's Phontograph.

containing carbon granules. This funnel takes the place of the uppermost roller, and a flat conducting plate, supported below the orifice in the bottom of the funnel, serves the purpose of a second roller, space being left sufficient to allow the perforated ribbon to travel freely between them. When the ribbon is drawn between the funnel and plate the carbon granules fall from the funnel into the perforations and make contact with the bottom plate.

It will be understood from the above that as the perforations in the insulated ribbon vary in size, in the same proportion will more or less carbon fall into them and the resistance of the circuit be varied. The larger the perforation the greater the space which will be occupied by the granules and the lower the resistance of the circuit; and as must necessarily follow, the smaller the perforations, the less the space for the granules, and the greater the resistance of the circuit. Mr. Irish, however, prefers the two elastic conducting drums, as illustrated, instead of the funnel and carbon granules for transmitting.

These drums make contact with each other through the perforations only, and so vary the resistance of the circuit accordingly. The interruptions and variations in the resistance of the circuit caused by the passage of the perforated ribbon between these contacts are made to reproduce on a receiving instrument at the distant end of the line the same sounds which actuated the diaphragm and perforated the ribbon at the transmitting end. The system permits of the making of a permanent record of all messages transmitted and in such a manner that the messages may at any time thereafter be again transmitted by simply passing the ribbon between the contacts, or for local re articulation or reproduction between the cold platinum point and its recessed drum. In either case the perforated ribbon is drawn between the contacts or between the platinum point and recessed drum by the clock-work as when used while speaking, the ribbon being first wound back off the lower on to the upper reel. When the message to be reproduced is on a filed ribbon, the ribbon is placed in the upper reel and wound off on an empty one placed below. Thus these instruments act as transmitters and reproducers of all messages previously sent on them. It will be seen that a local circuit is employed for heating the platinum while transmitting, but not for the receiving or reproduction or retransmission of a message.

The receiver most generally used in connection with this transmitter consists of a tube with an enlarged end for the diaphragm and an ear piece outwardly like an ordinary telephone receiver, but here the similarity ends. A wire is stretched several times between the bottom of the receiver case and the diaphragm, each wire when doubled back being insulated from the next in such a manner as to cause the currents to travel each bend and the whole length of wire. The two ends of this wire are connected as usual to binding posts, to which also the line and ground wires are connected. The variations in the resistance and the interruption of the circuit caused by the difference of size or degree of the perforations, or their absence, cause the wire stretched in the receiver tube to expand and contract, correspondingly vibrating the diaphragm and reproducing the sounds given out at the distant end of the line. In this system of telephony the permanent and electro-magnets usually employed can be dispensed with, as well as carbon transmitters with diaphragms and tension regulators.

The transmitting part of this apparatus, according to the inventor, can be employed and gives excellent results as a phonograph. For this purpose it is found advantageous to employ a somewhat stiffer stylus than the platinum one referred to for perforating the ribbon. The ribbon employed may be of especially prepared paper or metal foil well insulated.

The instrument described makes sound vibrations visible and produces a permanent record of them which can be stereotyped and printed from. It not only makes speech visible, but is said to reproduce it in such quality of tone and clearness that persons acquainted with the speakers can recognize them by their voice.

Underground Electrical Conductors.*

BY PROF. GEORGE FORBES, F. R. S.

The author has designed the proposed system to fulfill several important conditions:

1. The conductors and their insulation should be economical in construction.

2. They should be protected from injury by a trough or casing.

3. This trough should be of small cost and its merits must have been well tested.

4. The trough must be capable of carrying conductors at several different potentials.

5. It must be possible gradually to add to the conductors as the consumption of electricity in a district increases.

6. An easy means must be provided for taking branches from the mains into houses.

7. An easy means must be provided for leading the conductors round gas and water pipes and other obstacles.

The first condition can best be secured by having bare copper wire conductors and air insulation.

The second and third conditions by using ordinary cast iron gas pipes, whose qualities are thoroughly well known and whose laying and repairing and keeping water tight is every day work in every town in the country.

The fourth condition is attained by having porcelain insulating discs, two in each cast iron pipe. Each insulator

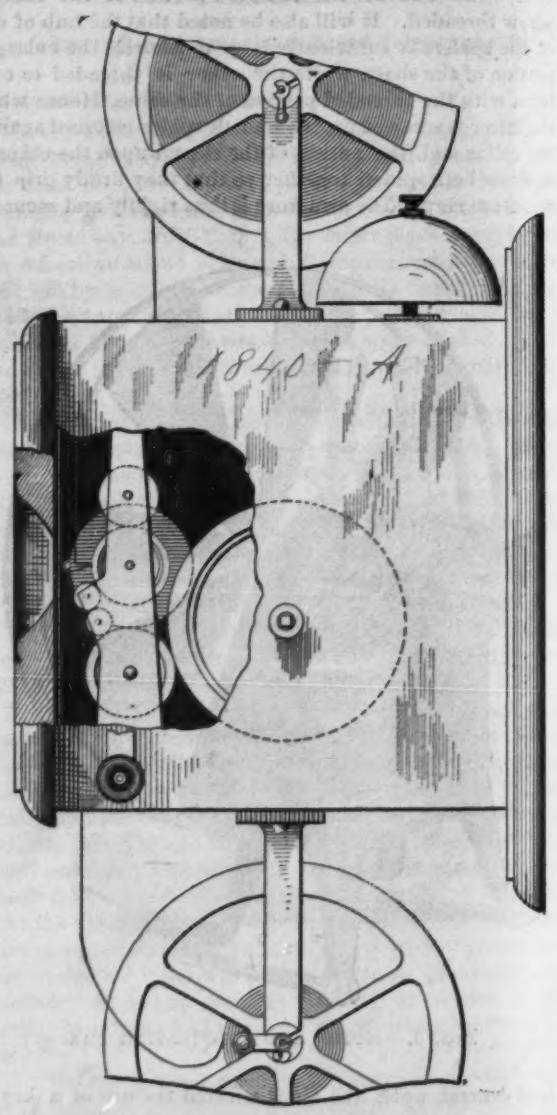


Fig. 2.—Irish's Phontograph.

has as many holes through it as there are different potentials to be maintained. These porcelain discs are supported on the iron pipes only at a few points; the intervening spaces allowing drainage in the cast iron pipes, and also permitting dry air to be forced through a system of pipes.

The fifth and sixth conditions are attained by the special peculiarity of this invention, which consists in using thin split copper tubes with a quarter-inch gap at the split. These are each six inches longer than one of the iron pipes. By pinching the end of one of these tubes and inserting it into the end of another, and continuing the process, a long continuous tube can be made for carrying the bare copper wire conductors. These continuous tubes pass through the holes in the insulators. The number of copper wires can be added to as the requirements of a district increase. When two-thirds full, these wires are all withdrawn and

* Read before the British Association, Manchester, 1887.

a bare wire cable filling the whole space of the tubes is drawn through. The wires are drawn through from manhole to manhole. A manhole is placed at each corner of a street, and serves also as a sump for pumping out accumulations of water. When it is required to connect a house to the mains, the iron pipe is drilled and tapped with a one-inch hole. Insulated wires are soldered to the copper tubes of the required potentials, and are led to the houses through inch gas pipes which are screwed into the hole tapped in the cast iron pipes. It will be noticed that the split tubes do not act primarily as the conductors of the main current, but mainly as a support for the conductors, and secondarily, by contact with these, as a means of connection to the houses, leaving the wires free to be removed or added to.

The seventh condition is to provide for getting round an obstacle. This is best done by having a hand hole at the ends of the cast iron pipes on each side of the obstacle and joining these by lead-covered insulated cables of the full current-carrying capacity of the system. These cables can be bent round the obstacle, and are in no way a weak point of the system.

The method of laying the conductors in the ordinary routine is as follows: For a three-wire system for a maximum of 2,000 lamps of ¼ ampère a three-inch gas pipe may be used. Each insulating disc has three one-inch holes in the positions of the angles of an equilateral triangle. In adding fresh lengths of conductor, three split tubes are first pinched at the ends and pushed into the ends of the three split tubes projecting from the last cast iron pipe laid. Two insulators are next run along the split tubes to a distance from either end of the tubes of one-fourth of their length. A fresh cast iron pipe is now run along over the split tubes and their insulators, the latter fitting loosely in the pipes. The joint of the pipes is made with packing in the ordinary way. A new length is added in the same way. Manholes must be placed at each corner of a street, and may be half a mile apart. The cast iron pipes fit into side holes in these boxes, and are fitted in with water-tight cement or packing. Wires are pulled through from manhole to manhole, and may be soldered together across the manhole. Finally, holes are drilled and tapped in the cast iron pipes beside those houses which require a supply of electricity. Two insulated wires, bared and flattened at their ends, are soldered to those split copper tubes which are of the right potentials. A 1-inch gas pipe is screwed into the hole tapped in the main pipe, and the insulated wire is thus led into the house.

Train Telegraphy.

At the invitation of the Consolidated Railway Telegraph Company, of this city, a large party of electricians and others made a trip upon the Lehigh Valley Railroad, on Thursday, Oct. 6, to inspect the operation of the system of train telegraphy in use upon fifty-four miles of the road.

The system, due to Edison, Phelps, Gilliland, Smith and others, is well-known in its main features to our readers, but certain modifications have been introduced which have greatly improved its efficiency, so that as it now stands, all the difficulties heretofore encountered may be said to be entirely overcome.

In the first equipment on the Lehigh Valley Railroad the inductive receiver on the car consisted of a coil of many turns of wire wound around the car, and the line conductor was an insulated wire laid along the track. While this system left little to be desired, it involved some expense which is avoided by the method used at present. This consists in the employment of the roof of the car, where such is available, as a static receiver, and the line is an ordinary wire strung upon short poles near the track.

With the present system the roof of the car is, in most cases, available, and a car can be equipped ready for work in a remarkably short time. All that it is necessary is the attachment of a wire to the roof, another to the swivel plate of a car truck for a ground, and the insertion of the instruments in the circuit thus formed. Such was the arrangement of the directors' car which was attached to the special train on the excursion, and the whole equipment did not occupy ten minutes.

The system as it exists to-day, briefly stated, consists mainly in the use of the "short pole" telegraph line extending along the side of the railroad track at about a distance of eight or ten feet from the line, the poles being much smaller than ordinary telegraph poles, and from ten

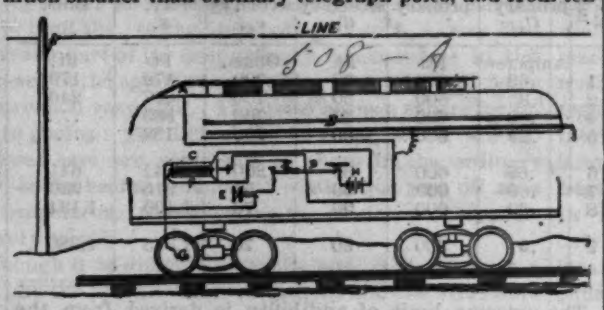


FIG. 1.

to sixteen feet high. At their top is placed an ordinary glass or porcelain insulator, strung upon which is a single galvanized steel (or iron) telegraph wire about No. 12, American gauge. As remarked before, wherever practicable, the metal roof of the car is employed as the inductive receiver of the car, but where no metal roof exists an iron or brass rod or tube half an inch in diameter is employed, placed under the eaves of the car. From the roof, the wire passes to the instruments, and then to the wheels of the car. The diagram, Fig. 1, shows the arrangement. The roof *A* or bar *B* are connected to the secondary *C* of an induction coil. The primary of the coil is connected to the front contacts of the double-pointed key *D*, in which is also included the battery *H*, and a buzzer arrangement opposite the core of the coil, for transmitting a series of impulses to the line whenever the key is closed. When the key is upon the front contact also, the extra contact shown at the top of the key closes the secondary circuit and allows the charges to be sent into the roof. When the key is on its back contact, both the

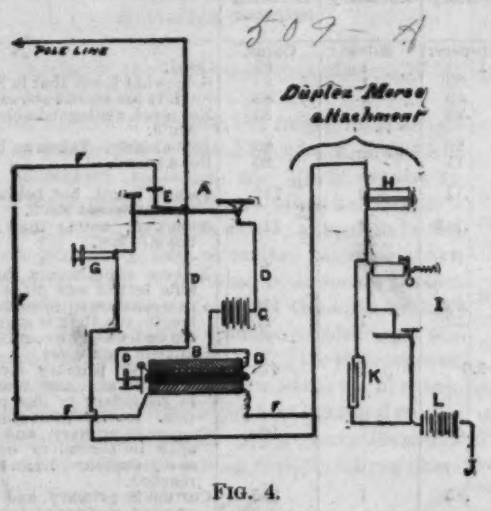


FIG. 4.

secondary and the primary coil are cut out, the charge from the roof passing by the wire from the roof directly to the key and thence through the telephone to earth.

The operator's equipment is quite simple, and consists merely of a small tablet to which the key, the coil and the buzzer are attached, and with just sufficient top surface to hold a telegraph blank conveniently, as shown in Fig. 2. The battery employed is inclosed in a box and can be placed beside the operator, as shown in Fig. 3, or can be stowed away in one of the closets of the car. Our illustration shows the operator exactly as he appears on the train with the telephone supported by head gear. A battery of twelve small cells is employed in circuit with the primary of the induction coil, although it is stated that communication can be kept up with two cells. The primary and secondary of the induction coil are respectively about 3.5 and 250 ohms. The receiving telephone is wound to 1,000 ohms resistance, and Mr. Phelps assures us that even when wound to 10,000 ohms the sound produced is quite as clear as with the 1,000, of such high E. M. F. is the induction upon the roof.

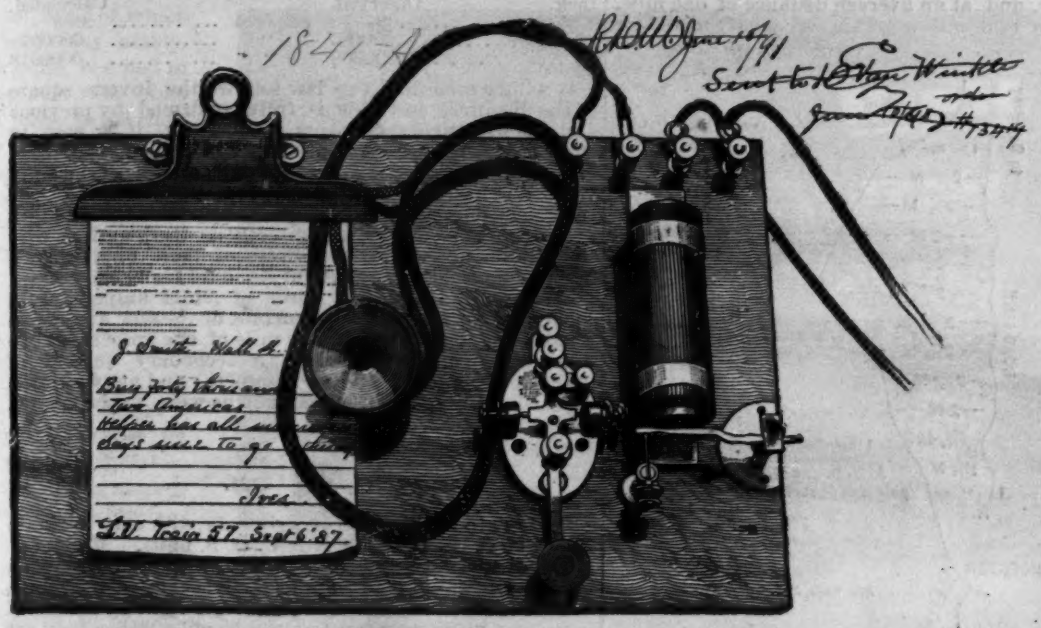
The arrangement at the terminal station, so far as the induction circuits and instruments are concerned, is identical with that on the car; but in addition there is supplied a Morse arrangement, as shown in Fig. 4, by means of which the line can be used for the transmission of ordinary Morse business. The circuit is made continuous for the induction system by means of the condenser *K*, which transmits the impulses when the Morse key *I* is open.

The cost of equipping a railroad with this system depends somewhat on the character of the roadway, nearness to telegraph pole markets, etc.; but it is said to approximate about $50 per mile for line equipment, *i. e.*, poles, wire, etc., and the labor of putting up. The cost of car fitting is about $15.

On the occasion of the recent trip, a large number of messages were sent and received from the train without the slightest delay of any kind, the arrangements being under the charge of Mr. S. K. Dingle, assistant superintendent of the company.

One of the most striking demonstrations of the wide application of the system was the sending of a dispatch from the rapidly moving train to Mr. John Pender, of London, Eng., via the Atlantic cable.

Among the gentlemen aboard the train were Thomas A. Edison, Lucius J. Phelps, E. T. Gilliland, Chas. A. Cheever, Prof. G. F. Barker, Prof. Henry Morton, Henry D. Hall.



FIGS. 2 AND 3.—APPARATUS USED IN TRAIN TELEGRAPHY.

Rolling Zinc Plates.

To the Editor of The Electrical World:

SIR: Can you inform me through the columns of THE ELECTRICAL WORLD what other metal the manufacturers of zinc plates mix with the zinc in order to roll them? I have tried to roll the best zinc I could get, but it always cracked in the mills, and what made me think that there was something mixed with the zinc was that I was breaking up some Leclanché rods, and they broke more like lead than zinc, as the fracture did not present the usual crystaline formation of zinc. R. W. R.

LONDON, Ont.

ANSWER.—Manufacturers of zinc do not mix anything with the metal when it is required to remain pure. While at ordinary temperatures zinc is brittle, it becomes perfectly malleable and ductile when heated to above 212 degrees Fahrenheit, or the boiling point of water, and it can then be drawn out into wire and rolled into plates. Care must be taken, however, not to heat it too much because at 400 degrees Fahr. it again becomes so brittle that it may easily be pulverized.—EDS. E. W.

English "Wire Tapping."—The *Pall Mall Gazette* tells the following story of a young operator: "He received the runners of a certain race, and his duty was to transmit them to the Exchange Telegraph Company, which distributed them to their various clients. The young man, however, kept back the runners until he received the result, which in turn he kept back until he had sent on the runners. His arrangement was to place the winner third among the runners, so that his confederates in the betting clubs always contrived to spot it, which was obviously advantageous to them. The young man is under remand, and is no doubt sitting on the stool of repentance. What is infinitely more amusing, instructive and paradoxical is that the prosecution is undertaken on behalf of the bookmakers."

On Induction Between Wires and Wires.*

BY W. H. PREECE, F.R.S.

Last year at Birmingham I pointed out that the electromagnetic induction between wire and wire upon lines of telegraph extended to distances much greater than was anticipated, and that effects were observed even when the wires were separated by the breadth of England. I was not satisfied with the last experiments made in the north of England. I had reason to believe that they were vitiated by induction and conduction through the network of cross circuits and railway wires in that part of the country, so in October of last year I took the district between Gloucester and Bristol, along the banks of the Severn, where it was possible to completely isolate two systems of wire separated by the River Severn for a length of fourteen miles at an average distance apart of 4.5 miles, and where any disturbing cross-inductive or conductive connection was impossible. The circuits on each side of the river could be completed by the earth or by metallic returns passing far inland, in the one case through Monmouth, and in the other cases through Stroud. The experiments made were very numerous, but the results were almost negative. No measureable effect whatever could be detected when primary currents of .449 ampère strength were intermittently sent by a rapid vibrator or buzzer on each side, though it was just possible to distinguish faint Morse signals. It was quite clear from subsequent experiments that we were on the extreme verge of audibility, and had we been able at the time to increase the strength of our primary current, we should have heard louder effects. In fact, I have taken this experiment as a measure of the limit of audibility—a conclusion fully confirmed by subsequent results. The experiments fully justified my conviction that those reported last year as occurring between Newcastle and Carlisle were wrong.

In all the following experiments the primary currents were always of rapid frequency, producing a buzzing sound, which could be easily read when audible, if sent in the Morse code, and received on a Bell telephone.

Two squares of 1,200 yards of gutta percha covered copper wire, or 300 yards each side, and of a resistance of fifteen ohms, were placed 300 yards apart in the Porthcawl Sands in South Wales, and conversation by the Morse code was readily maintained with primary currents of .226 ampère. Conversation by telephone was impossible. Two other similar squares were subsequently (December) suspended on scaffold poles 15 feet above corresponding squares lying on the sands, which latter were covered with water when the tide was up.

No difference whatever could be detected in the strength of the signals received by induction, whether the space were air or water, or a combination of air and water. The Irish wires on the railway were 150 yards distant from the squares, and the usual disturbance was evident on all the squares, whether under water or not.

The principal object of this experiment was an endeavor to differentiate any electro-static from the electro-magnetic inductive effect, and the conclusion drawn was that the whole phenomenon was electro-magnetic, for no electro-static effect could be obtained. No doubt with parallel wires on a line of poles, where the distance between wire and wire is far less than that between wire and earth, electro-static induction comes into play, but its effect in the cases investigated was absolutely inappreciable.

This was confirmed by further experiments made with squares of 33 ft. sides, fixed 3 feet apart.

Moreover, it tends to the conclusion that the magnetic field extends uninterruptedly through the earth as it does through the air, and that if the secondary circuit had been in a coal pit it would have been equally evident.

It also accounts for the peculiar disturbance observed in submarine cables when lying near each other as described in my previous paper. I hope to have the opportunity some day of testing the limit of audibility in water. Cables, as a rule, lie too far apart for the purpose. I have made several efforts to get results on our Irish cables; but they lie apart far beyond the limit. Mr. Ash, the superintendent of the Eastern Telegraph Company at Porthcurnow, in Cornwall, joined a telephone to the ends of two cables, one terminating at Lisbon, 820 miles away, the other terminating at Vigo, 620 miles away. Signals could be distinctly heard on the telephone from the Brest cable landing about half a mile away, and terminating at Penzance.

We happened, during the autumn, to be constructing a new trunk line carrying four copper wires from London to the coast of North Wales, and for many miles of its length in different places it ran parallel at various distances to the Great Western Railway. On Nov. 11, 1886, between Shrewsbury and Much Wenlock, 10¾ miles in length, a wire on the railway was made the primary wire, along which a periodic current of .08 ampère was sent. Strong signals were received on the copper wires, although they were completely isolated from any possible interference. The frizzling sound due to the ordinary induction from the mixed signals used in ordinary working were also evident, but the separating distance for eight miles was only one-quarter of a mile. Between Much Wenlock and Bewdley for a length of 12½ miles, where the separating distance averaged one mile 1,046 yards, the ordinary induction sounds entirely disappeared. On Nov. 28, 1886, similar experiments were repeated on a system of wires separated and isolated by the river Mersey for a distance of 11 miles. The primary circuit completed by the earth was on the Lancashire side. On the Cheshire side the secondary circuit was completed by a well-insulated metallic loop running inland, and measured 38½ miles in length. Morse signals were distinctly received. The separating distance was 1½ miles. In February, 1887, the section between Worcester and Bewdley was divided into lengths, as shown in the sketch.

A wire on the railway was made the primary, the periodic current being .12 ampère, but the results were *nil*.[2] In no case could induction be heard between any of the points *A*, *B*, *C*, or *D*, or upon the whole length. Resort was again made to squares in a field near Cardiff, removed from all possible interference, and the standard of comparison made was the limit of audibility. This is not an absolute or a scientific standard to use, but it is practical. It depends on the variation of the human ear and the sensibility of the telephone receiver, but as the results recorded were always the conclusions of several persons, and the same telephone receiver was used in all cases, the normal ear may be assumed to have been used, and telephones do not differ much from each other when the same pattern is used. But they are much dependent on surrounding circumstances and extraneous sounds, on slight noises arising from the wind, from the rustling of the trees, from showers of rain, from passing persons or vehicles. The results of these experiments are given in the following table:

TABLE A.

EXPERIMENTS ON INDUCTION AT LISVANE, 2D, 3D, AND 4TH FEBRUARY, 1887.

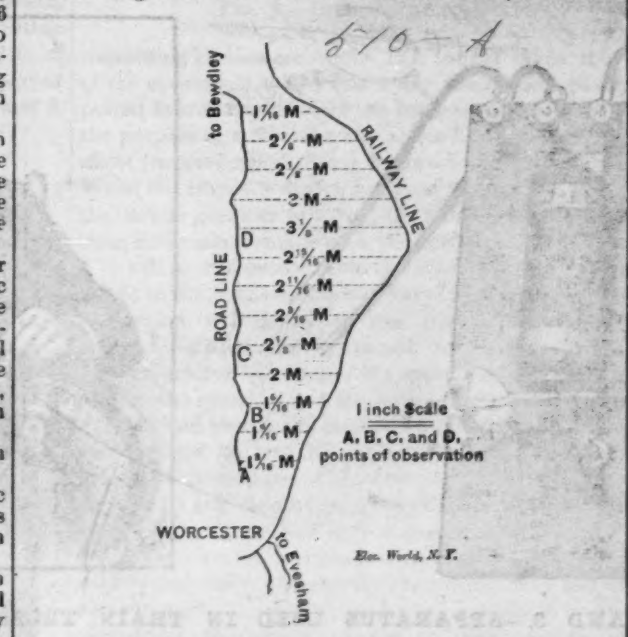
Experiment.	Current in primary. C_1.	Working face of primary	Working face of second'ry (l).	Resistance of second'ry r_2.	Limit of audibility. x.	Calculated results.
	Ampères.	Ft.	Ft.	Ohms.	Ft.	Ft.
1	.69	600	30	700	179	179
2	1.3	600	30	700	257	246
4	.69	600	30	700	585	....
5	.69	600	30	700	182	...
6	.69	600	30	200	641	641
7	.69	600	60	50	915	926
8	.69	600	90	76	1,100	1,134
9	.5	600	90	70	1,373	1,280

The extreme limit of audibility is derived from the Severn experiments, and is taken at 1.9016 miles, which would be the case were we operating with one mile of line and one ampère. Other conditions remaining the same,

$$x = 1.9016\sqrt{\frac{C_1 l}{r_2}}$$

from which the sixth column is calculated.

On April 10, when the system along the banks of the Severn was again resorted to as a primary, five wires running on the Midland Railway between Gloucester and Stonehouse were bunched at each extremity, and the secondary was one of the road wires which was parallel with the railway, and at an average distance of one mile, over a length of two miles. This secondary could be



INDUCTION BETWEEN WIRE AND WIRE.

joined up at will into sections of one and two miles long, the observations being made in the middle. Under these circumstances the following observations were taken:

TABLE B.

EXPERIMENTS ON INDUCTION, GLOUCESTER AND BERKELEY, APRIL 10, 1887.

Experiment.	Current in primary.	Length of secondary.	Resistance of secondary, including telephone.	Results.
	Ampère.	Miles.	Ohms.	
1	1	1	85	Good.
2	.73	1	85	Somewhat lower that in No 1.
3	.53	1	85	Slightly lower, but above limit.
4	.33	1	85	Not much distinguishable from No. 3.
5	.22	1	85	Just audible. Taken as limit
6	.11	1	85	Not a sound.
7	.11	2	112	Faintly heard, but below limit in experiment No. 5.
8	.148	2	112	Somewhat better than No. 7, but still low.
9	.22	2	170	In these experiments the two-mile length was made equal in resistance to twice the mile length, the audible sounds being under these circumstances alike in both wires
10	.22	1	85	
11	1.0	1	425	Current in primary increased five times, and resistance in secondary in like proportion. Audible limit reached.
12	.44	1	160	Current in primary, and resistance in secondary doubled, and audible limit again reached.
13	.85	1	335	Current in primary and resistance of secondary increased four times. Limit of audibility again reached.

Having thus obtained the conditions that determine the limit of distance across which induction is perceptible by the telephone, it became necessary to make some careful measurements so as to formulate the law that regulates the observed effects.

Let there be two wires placed parallel to each other for a length l, and at a distance d, then whenever the circuit is made in one wire a secondary current, C_2, due to electro-magnetic induction and in the reverse direction will be produced in the other wire, and when the primary circuit is broken, a current in the same direction will appear in the secondary. The relation between the primary C_1 and the induced currents is given by the formula

$$C_2 = MC_1.$$

M being a coefficient of induction depending on—

(1) The length l.
(2) The distance d.
(3) The resistance of the secondary circuit r_2.
(4) The rate at which the primary current rises or falls.
(5) The condition that determines the rate at which the current rises or falls in the secondary circuit.

The following experiments were made to determine these different functions of M. The new General Post Office at St. Martin's-le-Grand is an oblong building, with four convenient corridors or galleries all round the building, along each of which perfectly insulated gutta percha covered copper wires .050 inch in diameter were suspended along the wall. The wires were 20 feet apart, and each formed a complete metallic circuit, 250 yards in length, in which any apparatus could be inserted. The building itself is a huge magnetic field in a constant state of perturbation owing to the concentration there of a thousand circuits conveying messages. The consequence was that each experimental circuit was always in a state of disturbance, rendering accurate measurements during working hours impossible and speech out of the question. Nevertheless, it was quite possible to differentiate the sound of the voice from the rest of the noises though 80 feet of space intervened. It being quite evident that no other instrument than the telephone could indicate these effects, and my object being to measure them in absolute measure, two wires were suspended around one corridor at a uniform distance of 6 inches apart. After obtaining readings at this distance the space was increased to 12 inches, and finally reduced to a distance of ¼ inch.

The primary current .21624 ampère was obtained from a Daniell battery, and was made uniform in strength in all cases. The secondary currents were read by the throws of a Thomson galvanometer. The deflections were reproduced and measured as is done in measuring condensers. The average results of many experiments come out as follows:

Inch.	Observed.		Calculated.
.25	.004	ampères	.004
6	.000007	"	.000007
12	.000002	"	.0000018

It will be seen that the law follows the inverse square of the distance, and this is fully confirmed by previous and subsequent experiments. Moreover, it is easy to show that it must be so when we can neglect the influence of the earth. It is well known, and has been fully verified in all these experiments, that the strength of the secondary current will increase directly with the strength of the primary current, and directly as the length of wire under influence within the limits of these experiments. We can thus calculate a useful standard for use.

Two hundred and fifty yards of .21614 ampère, at 12 inches, induced a secondary current of .000002 ampère in a circuit of 13.27 ohms, or one mile of one ampère, at one mile distance, would induce a secondary current of .0000000000013, or 13×10^{-12} ampère; and at two miles, 3×10^{-12} ampère in wires such as were experimented with.

We can write the law thus—

$$C_2 = \frac{C_1 l}{d\, r_2} \times M.$$

I intend to repeat these experiments with care to obtain the value of the constant M in C. G. S. units. $M = .005$.

The disturbances due to the mixed working currents on our telegraphs cannot be appreciable beyond 450 feet, but those employed in distributing electric light by means of secondary generators must extend to miles unless they are neutralized by the two conductors being fixed parallel and close to each other.

I have not yet been able to make any experiments to determine satisfactorily the influence of retardation and electro-magnetic inertia on this limiting distance.

I erected two wires of iron for a mile alongside the copper wires, but was not able to get any conclusive results. It is, however, quite certain that there is a difference in the effect when the wires are of iron or of copper, and that the distance across which induction is perceptible must reach a limit of length when the resistance and capacity reduce the rate at which the currents rise and fall, and the effects must begin to diminish. Hence the disturbing effects due to short lines are more pronounced than those due to long lines.

This limit of audibility enables us to calculate the current required by a Bell telephone like that used in these experiments to become audible. It is roughly the six ten thousand millionth of a milliampère, or in figures .0000000000096 ampère, or 6×10^{-12} ampère.

Hence the air telegraphs used in America by Edison, Phelps and others for communication with passing trains are readily comprehended, and the distances to which disturbances are propagated between telegraphic, electric lighting, tramway circuits easily calculated. The distance through which communication can be maintained between ship and ship, between lightship and shore, between islands and the mainland, between the defenders inside and those outside a beleaguered city, becomes simply a question of calculation. I have been assisted in carrying out these experiments by Mr. J. B. Chapman, of my own office; by Mr. J. Gavey, of Cardiff, and Mr. J. R. Edwards, of Liverpool, both members of the Society of Telegraph Engineers, and the Post-Office engineers in charge of the districts affected, all of them careful and reliable experimenters.

* Read before the British Association Meeting at Manchester, September, 1887.

[2] The limit of audibility in this case was .66 mile.

Electric Lights for Hyde Park, Mass.—The most interesting question in Hyde Park at present is that of electric lighting. The advisory committee, appointed at the last town meeting, which has full powers, has voted to give the contract to the American Electric Manufacturing Company. The proposition is to illuminate the town with between 60 and 80 arc lights of 2,000 candle-power each. The town is now lighted with 367 kerosene or naphtha lamps, at an annual cost of $4,000. To light it with electricity, as proposed, will cost $5,500, and that amount has been appropriated by the town. At the last meeting of the committee it was voted to insert in the contract to be made with the American company the words, "actual 2,000 candle-power," in place of the words "commonly known as 2,000 candle-power." The brick building known as the tack factory, near the Providence freight depot, has been secured by the American Company in which to place the plant.—*Boston Herald.*

The New Telephone Exchange in Stockholm.

The beautiful city of Stockholm, the capital of Sweden, enjoys telephonic facilities without rival in Europe, and certainly equal to anything that can be shown in this country. Although it has a population of not much more than 200,000 inhabitants, it has fully 7,000 telephone subscribers, of whom 1,500 are connected up with the Bell exchange, and about 4,000 with the exchange of the Stockholm General Telephone Company. The latter company has just moved into its new exchange, and we are enabled to give herewith a view of the operating room. The room is on the third story of the fine building. It contains 20 multiple switch-boards of an ultimate capacity of 7,000 wires. At present 4,000 wires are connected up for service. The company has 100 employés, and has in operation about 3,400 miles of wire. Last year the exchange made nearly 6,000,000 connections.

It may be remarked that the exterior of the building which contains this fine central office is seriously disfigured by a huge and clumsy iron tower for carrying the wires. There appears to be an absence of cables, each wire running out from the tower singly. We believe that the Bell Company's exchange presents a marked contrast to this, owing to its use of cables, on the American plan.

THE ALLEMANNA TELEPHONE EXCHANGE, STOCKHOLM, SWEDEN.

Pyromagnetic Motors and Generators.

In the *Journal of the Franklin Institute* for October Mr. Carl Hering, in discussing the theory of the Edison pyromagnetic generator, has the following:

A study of the principles involved will show that there are practical limits to the development of such a generator, some of which have been very nearly, if not quite, reached in this machine. The chief one of these is the limit to the speed of the cutting lines of force, and therefore a limit to the electromotive force, or electrical pressure, which can be generated with a given field magnet. It is well known that it is the electromotive force or electrical pressure, and not the current which is primarily generated by any electrical generator, the current being dependent on this electromotive force, the size of the wire and the external resistance. This electromotive force is proportional to two factors, first, the amount of magnetism, or the number of lines of force, which is practically unlimited, as the field magnets may be made of any size; second, to the speed with which these lines are cut by the wire, which in this machine is dependent on the speed with which the magnetic qualities of the iron core may be destroyed and restored by the heat. This latter has a comparatively low limit in practice, 120 heatings per minute being, we are informed, the fastest rate at which these changes can take place. This means that the useful lines of force of the field magnet can be cut only 240 times a minute, while in the ordinary dynamo, having a speed say of 1,200 revolutions, the lines are cut 2,400 times a minute; from this alone it would follow that the amount of magnetism of a pyromagnetic generator of this kind, neglecting all other factors, would have to be ten times as great as in a dynamo generating the same potential. Such a generator is, therefore, allied to a dynamo having a very low speed, and must therefore be quite large as compared to an ordinary high-speed dynamo for the same output. Other considerations will modify these proportions somewhat, but as Mr. Edison himself states, the machines of this kind must necessarily be quite large and heavy. Fortunately, however, magnetism is cheap, and the large size and heavy weight of a machine is not always a very objectionable quality; it is outweighed many times by the fact that such a machine is stated to require no more attendance than that required for an ordinary furnace for heating hou es.

Another feature of these pyromagnetic generators, and one which will no doubt present many serious difficulties, is that the iron cores which are to be heated and cooled so rapidly, must necessarily be made of very thin metal, and as it has to be heated to redness to destroy the magnetic qualities, it is evident that rapid oxidation and disintegration of the metal will take place, which will seriously affect the life of those parts of such a machine. This feature may, however, not be an insurmountable obstacle, and opens a sphere for inventive genius or for discovery.

It is evident that the source of the electrical energy generated is the heat of the fuel, and that it takes more heat to raise the temperature of a magnetized piece of iron to redness than a piece which is not magnetized; or stated in technical terms, the specific heat of magnetized iron is greater than that of unmagnetized. The difference is evidently that which may be converted into electrical energy. It is, of course, not necessary to heat and cool the iron through a greater range of temperature than is required to produce the magnetic change, which range, it is said, is not very great; and, therefore, it may ultimately be possible to limit the heating and cooling in such a way that the greater part of the heat actually consumed is in this difference in the specific heats, thus making the efficiency of conversion very high. This also opens a sphere for inventive genius. The difficulties, however, which are encountered here are analogous to those in the ordinary boiler, as the heated products of combustion pass off at a high temperature, thus lowering the efficiency of conversion very greatly.

Although it is difficult to make any predictions at a time, like the present, when inventions and discoveries are so numerous, yet we are probably safe in venturing to say that the great problem of obtaining electrical energy directly from coal or other cheap sources of energy, will ultimately be accomplished in a different way than by means of such pyromagnetic generators. Although this is a step in the right direction, it is by no means a complete solution of the problem. The chief alternative methods at present known to us are the thermopile and the battery. While the future of the former does not seem to be promising, the latter has already made considerable progress, chiefly in the form of batteries consuming heat or some cheap fuel, such as gas or carbon.

Regulation of Incandescent Lamps by Secondary Batteries.

We are in receipt of the following from Messrs. W. F. Collins and A. E. Braddell:

In the English *Electrical Review*, the following criticism has appeared on our article in THE ELECTRICAL WORLD of Aug. 15 on secondary batteries and their regulating properties: "From a paper by Messrs. Collins and Braddell in THE ELECTRICAL WORLD, it would appear to be the opinion of these gentlemen that secondary batteries when used in connection with a dynamo will ensure perfect steadiness in the lamps independently of the kind of machine employed. This is quite a delusion. Although the battery necessarily has a constant E. M. F., the difference of potential at its terminals varies with the variation in speed, and it becomes a question which is the best kind of dynamo to make the variation a minimum. As we have formerly shown, this is a shunt dynamo with a *rapidly* falling characteristic."

The following is a copy of our letter in reply to that criticism, which explains some of the points in our article which seem to have been misconstrued:

"*The Editor Electrical Review, 22 Paternoster Row, London:*

"DEAR SIR: We noticed in your valued paper a criticism on our article in THE ELECTRICAL WORLD of Aug. 18, on Secondary Batteries and Their Regulating Properties. You state that we appear to be laboring under the delusion that the regulating qualities of accumulators when used in conjunction with a dynamo insure perfect steadiness in the lamps, no matter what kind of machine is used. If you will read our paper a little more carefully you will see that we state, to quote our own words, 'Accumulators *may* be charged with a "series," "shunt," or "compound" machine, but for this purpose a shunt machine is greatly superior,' and, again, "this shows that the shunt machine is the most advantageous for charging secondary batteries." An ordinary compound machine would, if properly wound so that it developed a constant difference of potential at the terminals when run at its proper and constant speed, hardly be supplied to *steady* the lights, for it would be useless to incur the extra expense of furnishing the machine with series coils unless it could be run at a practically constant speed, for on this the whole automatic regulation depends. With regard to 'series' machines, they are rather 'obsolete' for running incandescent lamps. The reason of our explaining how a series machine might be used to charge accumulators was as follows: In many places where arc lights are used and run only at night it is sometimes very convenient to have a few incandescents as well, without the expense of a special machine; hence in the day when the machines are not running the arc lights, they might be employed to charge some secondary batteries, which could then be used to run the incandescents while the machines are running the arc lights. We also stated that the regulation is only obtained when certain conditions are maintained, namely, that the internal resistance of the cells must be practically negligible, which applies when the machine is supplying current to the cells. Then a shunt machine with a "steep" characteristic will give practically perfect steadiness to the light, even if the engine varies slightly in speed. Again, the charging E. M. F. must be kept higher than the counter E. M. F. of the cells. This being the case when the cells are charged, the machine is supplying the current to the mains and little or none is flowing through the cells, or the cells may be supplying current to the mains as well; then the steadiness will depend on the excitation of the field magnets remaining constant. If we had a perfect compound machine and a perfect engine, accumulators as regards their steadying properties might be dispensed with. But without this they are very useful with respect to the regulation of incandescent lamps."

The Chesley Repeater Arrangement.

To the Editor of The Electrical World:

SIR: I note your description, in the last issue of THE ELECTRICAL WORLD, of a repeater designed by Mr. W. S. Chesley. I beg leave to state that a precisely identical arrangement was perfected by me in 1883 and worked in the Norfolk (Va.) office of the Southern Telegraph Company. Mr. F. W. Dillingham, then chief operator in that office, now in business with a well-known cotton firm in your city, can substantiate this statement, if necessary or desirable.

Truly "There is nothing new under the sun!"

LYNCHBURG, Va., Oct. 10. CECIL P. POOLE.

Benjamin Franklin.—Houghton, Mifflin & Co. are about to publish in their American Men of Letter series, a life of Benjamin Franklin, by Prof. J. B. McMaster, the author of "A History of the People of the United States."

Prevention of Fires in Theatres.—With a view of lessening the loss of life and property by reason of fires in theatres, the Polytechnic Section of the American Institute purposes investigating the cause of such fires and considering the best means of their prevention. Mr. Robert Grimshaw, president, has appointed as members of a committee to assist him in this laudable work, Messrs. M. C. Baker and J. F. Hotchkiss. The co-operation of the New York Board of Fire Underwriters has been secured, and that body has named Mr. Von Geison as its expert and representative in the matter.

The Waldumer Electric Brake.—At the recent trial of this brake near Cincinnati, a train of three passenger cars, one freight car and a caboose was used, all empty. On a down grade of 68 ft. per mile brakes were applied 330 ft. from a point where steam was shut off. The train was stopped in 32 seconds, 500 ft. distance. In a breakaway trial the train was stopped from the caboose, at 800 ft. in 33 seconds. A graduation test was made, the speed being reduced from 30 to 15 miles and held. With a train of six cars and caboose the stop was made from 49 miles an hour, brakes being applied as before, 330 ft. from shutting off steam; time, 25 seconds; distance, 974 ft. Other trials were made with freight cars mixed in the train without brakes. These figures are from newspaper reports and may be corrected.—*Railroad Gazette.*

Electro-Plating with Aluminum.

Herman Reinbold, in the *Jewelers' Journal*, says: The solution of the plating bath is as follows: 50 parts of alum, $AlK(SO_4)_2 + 12\ H_2O$ are dissolved in 300 parts of water, and to this 10 parts of chloride of alumina (Al_2Cl_6) are added, heated to 200 degrees and cooled, whereupon 39 parts of cyanide of potassium are added. The object to be plated has to be cleaned, and to be absolutely free from grease in any form, whereupon it is suspended in the bath over the electro-positive electrode, the plate of metallic aluminum to be suspended on the negative pole. The electric current ought to be weak.

The plating when polished will be found to be equal to the best silver plating, having the advantage of not being oxidized or getting black when brought into contact with sulphurous vapors, which would make it especially valuable for plating spoons and tableware.

A High-Speed Automatic Engine for Electric Lighting.

The requirements of uniformity of speed in dynamos under all loads, upon which their regulating properties in many cases depend, has led to the construction of high-speed automatic engines, in which special care has been given to regulation. Among those recently constructed, with this end in view, is the one shown in the accompanying illustration, Fig. 1, and built by the Taylor Manufacturing Company, of Chambersburg, Pa.

As will be seen, the main engine frame is of the trunk girder shape, thus providing ample strength both above and below the centre line of strain. The cylinder is provided with large and direct steam passages, and the valve chamber is situated at the bottom of the cylinder, so that all condensation is carried off, insuring constant lubrication of the valve. The latter is of the hollow piston type, and works in bushings, which are secured in the valve chamber in such a manner that they can be easily removed in case of wear, and new ones inserted.

The speed of the engine is maintained constant for all loads by the regulator shown in Fig. 2. By means of the latter the full throw of the eccentric is accomplished with less than an inch movement of the weights, so that extreme variation of loads from nothing to full capacity of engine causes no appreciable variation in speed of the engine, there being only a slight change in the speed of the weights, necessary to move them through so short a distance. Stiff springs and moderately heavy weights are employed, producing a very prompt action of the eccentric. A very ingenious device is used in connection with the springs and weights, which overcomes all the tendency to racing of the engine. By its use a very sensitive adjustment of the springs and weights can be made, and thorough regulation of speed obtained. This attachment is a vane which revolves in a closed case *J* filled with oil, and is attached to the eccentric by a toothed rack *K* and pinion. The movement of the weights propels the vane in the oil, which movement is not sensibly resisted by the oil, except in the case of sudden action; consequently the jumping of weights and racing of the engine is prevented. It is claimed for this engine that its control over the steam and sudden changes of load is so perfect that the throttle valve can be instantly thrown wide open, admitting full head of steam in starting the engine, and the motion of the engine will increase to full speed as evenly as if regulated by a gradual opening of the throttle. The eccentric is connected directly to the valve, so that its action is instantaneous, admitting steam to the cylinder at full boiler pressure, varying the point of cut-off as resistance requires, from its beginning to three-fourths stroke.

Special attention has been paid to the wearing parts, which have been made of ample size, and wherever necessary steel is employed and efficient lubrication has been well provided for.

We may add that this engine has recently been introduced in a number of electric lighting stations, both arc and incandescent.

The "Regulator" Oil Cups for Electric Light Stations.

All who have charge of electric light stations, or of other establishments where high speed machinery is in use, appreciate the importance of a first quality oil cup in connection with their machines. The accompanying illustration represents the "Regulator" oil cup, which has lately been introduced to the notice of electric light companies and others by the New England Wiring and Construction Company, of Boston, Mass.

THE "REGULATOR" OIL CUP.

This cup possesses several new features that peculiarly adapt it to the purposes for which it has been designed. It contains two valves, one to regulate the feed, and the other to start and stop it. No adjustment is necessary after the feed has been once set, and the fact that the valve which determines the feed does not require to be moved a second time insures it against wear and consequent change of feed.

The base of the cup is of best composition metal, and is tapped with standard gas-pipe threads, or with any special thread which may be desired. As will be seen in the cut, it is provided with four round apertures, through which the oil may be seen passing, drop by drop, to the bearing below. Inside the base, a piece of Scotch glass tubing thoroughly protects the bearing from dust or grit. The body of the cup is of glass, and the quantity of oil in it may be readily seen; but the special feature of the cup is its regulating device.

The spindle *A* forms a tapering valve, and by means of it the feed is adjusted. The sleeve, or jacket, *B*, which incloses the spindle *A*, works up and down on the bottom of the cup by a quick thread, thus opening or closing the ports in the bottom, and controlling the escape of the oil. As the sleeve has a quicker thread than the spindle, a very secure lock is obtained, and it is claimed that the setting cannot be affected by the vibration or jarring of machinery, nor change made in the position of the spindle regulator. When shut down the sleeve passes over the ports and stops the flow of oil.

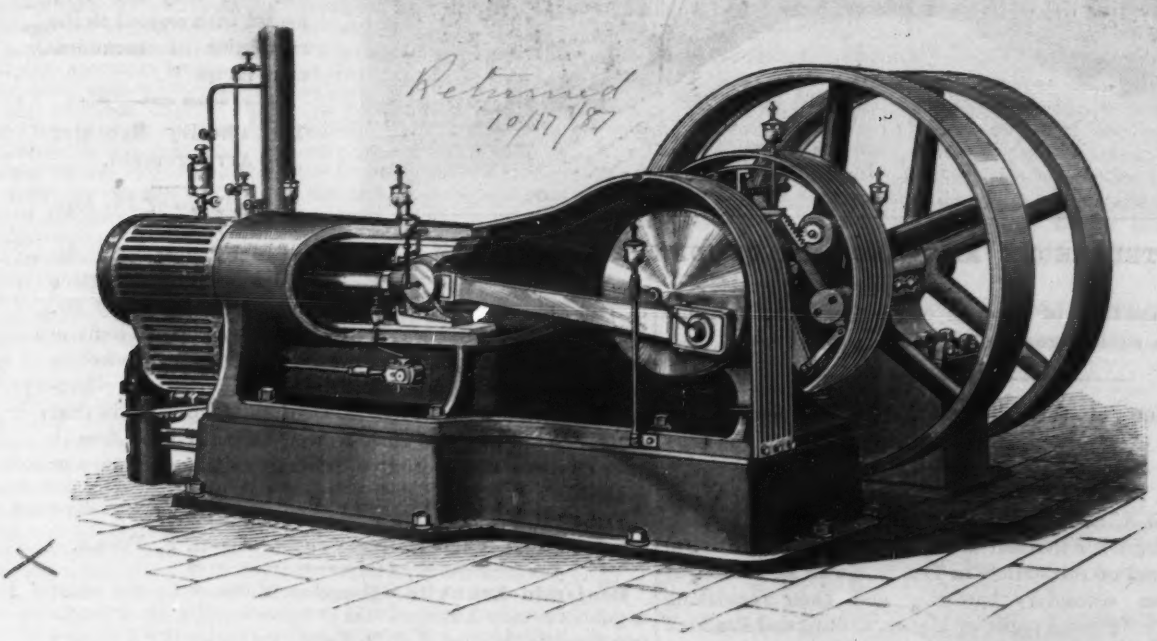
When the spindle *A* is adjusted so as to give the right flow of oil necessary to keep the bearing cool, the adjustment need never be altered unless a change is made to an oil of a different specific gravity.

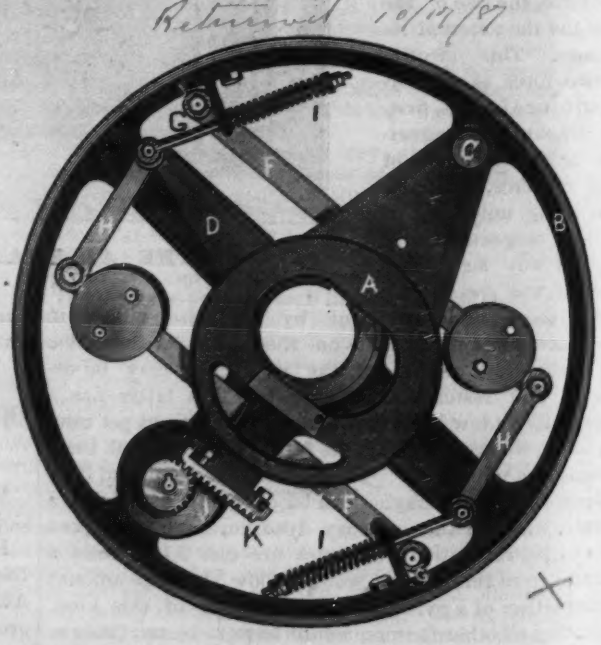
To start the cup the sleeve *B* is turned up part way, and the feed-valve or spindle *A* is adjusted with a wrench *C*, or by a thumb-screw, if that is preferred. *B* is then turned up to the proper position, so that the ports are open and the valves locked, the top of the sleeve *B* and the base of the spindle cap *A* forming the lock, as above described. To stop the feed *B* is turned down till it closes the ports. To start it again, after it has once been adjusted, it is only necessary to turn *B* up again until it locks with *A*. These operations, owing to the quick thread, are performed in an instant.

Another marked advantage is the readiness with which every part of the cup may be separated from the others for cleaning, and there are no projecting springs or studs to catch waste and change the feed or let in dust. It is also very easily filled by simply sliding the cover up on the sleeve *B*.

Mr. Edison on the Patent Office.

In a recent interview Mr. Edison draws attention to the difficulties encountered by inventors, which, he claims, are due mainly to the patent system and its administration. He comments on the fact that "whenever a valuable thing is put on the market, from one to a dozen needy persons suddenly remember that they invented it prior to the person who holds the patent." The usual plea of such inventors is that they are "too poor" to get out their patents. Mr. Edison would remedy all this by having the law changed so as to give every man the right to file a patent for $1, the government to guarantee that patent to the first filer against all comers. While the reduction in the cost of filing a patent will be acquiesced in by many, the granting of a patent to the first filer will hardly be looked upon with equal favor by inventors generally: for though some, with large facilities, are able to bring an invention to perfection in comparatively short time, others are forced to delay the publication of their ideas by the incompleteness, due to the thousand and one difficulties which beset most inventors. To discriminate in such cases, therefore, would not be equitable. But it cannot be denied that some means ought to be devised for checking the dishonest practices of alleged prior inventors. The great danger which threatens under the present conditions is that all such things which can be kept secret will not be patented, and Mr. Edison himself states that he is now pursuing that practice and patenting only those inventions the nature of which leaves no alternative. If this practice should be generally followed it would lead to a most deplorable state of affairs and completely vitiate the object of the whole patent system. The great purpose of any patent law is the *publication* of new inventions and processes so that they may not be lost to the world or remain secret; in consideration of which publication the government guarantees the inventor an exclusive monopoly for a term of years. Should Mr. Edison's example be imitated by other inventors, the world would soon relapse into a state of affairs similar to that existing in the middle ages, when "trade secrets" took the place of patents. But while with the present advanced state of knowledge this order of things is less to be apprehended and fought against than formerly, it would nevertheless be well to take such measures as to remove all complaints and to make the patent administration what it ought to be; for herein lies the root of the whole evil. Both the patent system and Patent Office require attention, and are capable of better service.





FIGS. 1 AND 2.—NEW HIGH SPEED AUTOMATIC ENGINE FOR ELECTRIC LIGHTING.

Fort Wayne, Ind.—The Pennsylvania Company has lately purchased of the Ball Electric Light Company, of New York, an electric lighting plant consisting of 190 arc and 300 incandescent lamps. The plant is now being installed in the shops and depot at Fort Wayne, Ind.

NEW YORK NOTES.

OFFICE OF THE ELECTRICAL WORLD,
NEW YORK, Oct. 10, 1887.

The Bradley Electric Power Company have taken a suite of rooms in the new Telephone Building, 18 Cortlandt street, this city, where will shortly be found a full line of their dynamos, motors, etc. Meantime their specialties will be shown at the American Institute Electrical Exhibition.

The Ball Electric Light Company has just issued a new catalogue, for a copy of which I am indebted to Mr. C. P. Whitney, the secretary. It contains a notable list of Ball plants in operation, and a remarkable feature of the list is the large number of "increases" showing that the users of the system are well pleased. The company is now doing the arc lighting at the Exhibition.

Calling upon the Standard Electric Light Company, 24 Centre street, recently, I found the system in operation. It comprises an ingenious clutch lamp and a new dynamo of the Gramme type. I believe Mr. A. G. Holcomb is the inventor of the system.

The American link belt of Charles A. Schieren & Co. seems to be achieving considerable practical success. I have already mentioned its leading merits, such as convenience of adjustability, freedom from slipping, ease of lengthening or shortening, etc. Among recent purchasers of this belting for dynamos are the Woonsocket (R. I.) Electric Machine and Power Company; Van Choate Electric Light Company, of Boston, Mass.; Edison Electric Illuminating Company, of New Orleans; Edison Electric Illuminating Company, of Brockton, Mass. (third order); Edison Electric Illuminating Company, of Boston, Mass.

The system of the Union Fire Alarm Company, of 145 Broadway, this city, has just been introduced in the huge wagon building establishment of Studebaker Brothers, at South Bend, Ind. These works cover no less than 28 acres, and the plant put in comprises 8 boxes, containing the calling mechanism of a new and ingenious character, cutting in and out insulated points on a disc that conveys the current periodically to the electro-mechanical gong. This gong also strikes the number of the locality of the fire in any part of the big works, and gives the number as well on one of the company's indicators, which works automatically in conjunction with the bell. The Union Fire Alarm Company have now on view in their Broadway office their new electro-mechanical tower bell striker. When I was in the other day, they hung the office boy on the gear wheel as a substitute for the weight employed in regular work to operate the mechanism, and it worked very nicely. In fact, the *modus operandi* of the whole system can be easily seen from the apparatus displayed in the office.

Mr. John Hogan, mechanical engineer, of 87 Centre street, has recently issued specification formulas for steam heating plant with an explanatory index. It is said to be the first sample of this class of work, and is, as far as I can judge, well done. By the way, could not something similar be attempted for electric light and power plants?

Mr. C. J. Bogue will sail for Sidney, Australia, in a few days, to take charge of the office there of the American Electric Manufacturing Company. He is to install in Sidney 800 arc lamps, of which 200 are already on their way. Mr. Bogue will also have in hand the work of introducing the American system throughout Australia, and thus of making another market for the products of Yankee ingenuity and skill.

I was taken the other day through the factory of the Empire City Electric Company, 15 Dey street, by Mr. J. H. Blasdell, the manager of the company. I found a large force of men actively engaged making bells, batteries, annunciators and specialties of all kinds, particularly the window tapper now so well known all over the country. One very interesting point about this factory is that all the various machinery is run by a 5 h. p. Daft motor, to which current is supplied from the Spruce street Electric Power Company's station. This plant has now been in operation some time, and not the least trouble has arisen, the motor doing its work well under all the conditions of varying load. Next year, when outstanding leases fall in, Mr. Blasdell proposes to use the entire building, and meantime the space occupied is crowded.

Mr. F. J. Sprague and Mr. H. McL. Harding, of the Sprague Electric Railway and Motor Company, have just returned home from a Western trip, during which, while in search of health and recreation, they have not failed to look into the question of applying electric motors to mining purposes. They seem prepared, as a result of their inquiries and studies, for a genuine motor "boom" in the West, where undoubtedly a number of wants can be filled by this application. Incidentally I hear that two 25 h. p., one 20 h. p. and one 5 h. p. Sprague motors have been sold for use in the large flouring mills at Laramie, Wyo. The William Street Railway Company, St. Joseph, is so well pleased with the performance of its Sprague car, with overhead conductors, that it is now arranging to equip 27 more cars. It has obtained on its road a speed of 20 miles an hour with 94 passengers. The West End Company, in Boston, is also reported to be pleased with its car recently sent on. The Sprague Company has submitted an estimate for 80 cars for Spain, and a South American government has sent on a representative to make a contract for 200 cars.

W. T. H.

NEW ENGLAND NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
BOSTON, Oct. 10, 1887.

The Boston Electric Club had its housewarming at the commodious and elegantly furnished rooms of that body, No. 66 Boylston street, on Wednesday evening, October 5. Upwards of two hundred gentleman were present; and it proved an enjoyable as well as a noteworthy occasion. The Boston *Herald*, in its account of the event referred to, says: "It drew together about 200 members and their friends, and while felicitously celebrating the formal opening of the club with a night of pleasant intercourse and social relaxation, illustrated the remarkable vitality of a society which, though only formed in June of the present year, has already the prestige of growing numbers and assured success. The house committee of the club had scattered their invitations far and wide, and such was the response given that at 8 o'clock the rooms were thronged with guests. Mayor O'Brien was looked for early, but he found himself unable to be present, and therefore had to content himself with sending a note of regret and good wishes. One of the earliest to arrive was the president of the club, Mr. Frank Ridlon, and he was closely attended by other officers of the association.

When the guests had all gathered in the reception room, President Ridlon took the chair for the transaction of preliminary business. Having first extended a hearty welcome to those present, he introduced Mr. P. H. Alexander as toastmaster for the evening, and then called upon the secretary. Mr. Allan V. Garratt announced that it was his unpleasant duty to communicate the resignation of Mr. W. J. Hammer, one of the vice-presidents. The secretary read a letter from Mr. Hammer, who explained that he was about to remove from Boston, regretted the step he was forced to take, and expressed his confidence in the future prosperity of the club. A committee of three, with Col. C. M. Ransom as its chairman, subsequently brought in a resolution on the subject. They accepted the resignation with regret, and, in doing so, expressed the high admiration felt by the members of the club for Mr. Hammer as a gentleman and as an authority on electrical matters. The resolution gave expression to these feelings, and was adopted by acclamation. Mr. G. W. Adams next presented the club, through Mr. P. H. Alexander, with a finely-drawn framed portrait of its first president, saying as he did so: "This is a portrait of Mr. Frank Ridlon, our first president, a gift to the Boston Electric Club from his friends of this association. I trust it will grace the inner walls of this room, and I know it will gladden the heart of every member. I present it to Mr. P. H. Alexander, Chairman of the House Committee." During the delivery of this speech the picture was unveiled amidst enthusiastic applause.

President Ridlon said in reply: I am completely surprised, and this is not the time when I could make a speech on the subject. I thank you one and all, gentlemen, for the gift you have made to this club. In the future, when this club has grown to what I have prophesied and believe it will grow to, some future president will look back and see what crude material we had for the first starting of the Boston Electric Club. [Loud laughter and applause.] Secretary Garratt added: In view of the very modest speech which has just been made, I cannot refrain from asking you one and all who heartily approve of this act of presentation, and of the little implication of kindness and courtesy to our president which it carries with it, to raise your right hands. Mr. Garratt's suggestion was warmly and unanimously carried into effect.

While the members were admiring the crayon portrait, a shout arose that President Ridlon was to have a photograph as well, but caterer Mark Simons contrived a diversion and caused much laughter by rushing forward and presenting the chair with a "cake."

The present alluded to was a large and frosted fruit cake, in the top of which was imbedded a handsome photograph of President Ridlon.

About ten o'clock, Mr. Alexander called the happy gathering to order, and at his suggestion toasts were responded to by Col C. M. Ransom, W. M. Callender, Frank Ridlon, J. S. Meredith, of the *Boston Journal*; Suel Smith, A. H. Chapman, Prof. Elihu Thomson, W. J. Hammer, Lieutenant Greene, U. S. N.; Morgan Brooks, Ex-Mayor N. Lawton, of Bangor, Me.; William Brophy, and Gen. E. Nickerson.

After the speech-making—which was listened to attentively and frequently applauded—the president invited the gathering to adjourn to the upper floor where refreshments awaited them. Caterer Mark Simons, the well-known restaurateur of Boston, had transformed the billiard room and card parlors into banquet halls, and an abundance of delicacies filled the tables.

Supper over, coffee and cigars followed in the reception-room below, where a pleasant surprise awaited in the shape of a corps of seven colored singers, who started up their quaint but harmonious plantation songs, and finished with some of the latest popular airs. For upwards of an hour the music entertained those present, and afterward, and until the evening came to a close, jokes, pleasantries, and stories held a majority of the members and other gentlemen in happy bondage at the club-rooms. As the good-byes were being exchanged the president suggested that a vote of thanks be extended to Mr. Simons for the excellent repast he had so admirably served, and more particularly for the handsome bouquets of flowers and boutonnières handed each gentlemen (the flowers being a generous gift from the caterer). An enthusiastic response followed President Ridlon's motion, and the housewarming was at an end. It is appropriate to say that everything at the gathering passed off harmoniously and to the entire satisfaction of the members of the club.

Mr. Samuel Elder, representing the American Electric Manufacturing Company, has been awarded a contract by the city of Lewiston, Maine, for the construction and equipment of a plant of one hundred light capacity, of the American system, for use on the streets and in the public buildings. The committee of nine appointed to investigate the merits of the various systems and to receive bids, made a report recommending the American, and at a joint meeting of the Board of Aldermen and Common Council, on the evening of Sept. 29, this report was accepted and the contract awarded in accordance therewith. Ten companies submitted proposals for the business, and the result of the competition is alike creditable to the American Company and to Mr. Elder, who has had charge of its interests in the negotiations. The American system is also to be used in the cities of Lewiston and Auburn for commercial lighting, rights of way for this purpose having been granted Mr. E. W. Gross, of Auburn, who is acting in conjunction with Mr. Elder. Water-power is to be used, a valuable privilege on the Little Androscoggin River having been purchased, about seven hundred horse-power being available for use. The dam is almost completed, and the wheel will be in position within a few days. Work on the station and line construction is being pushed as rapidly as possible. It is understood, also, that incandescent lights and electric power will be supplied from the same station.

The Boston Electric Light Company has declared a quarterly dividend of 1¼ per cent., payable Oct. 15.

Messrs. Paine & Francis, New England agents of the Edison United Manufacturing Company, have been awarded a contract for the installation of 150 incandescent, 16 c. p. lights in the mills of the Kezar Falls Woolen Company, Kezar Falls, Maine.

Advices from Houlton, Me., report that the Thomson-Houston Electric Company's local electric light plant in that town has been purchased by the Houlton Water-Power Company. It is probable that the electric light and water-power enterprises will be under one management.

A prominent citizen of Brattleboro, Vt., made the following statement to a correspondent of the Boston *Transcript*: "The Brattleboro scheme for the organization of an electric light company has advanced to the point of asking for a charter, and it is understood that the existing plant will be merged with that of the new company, which proposes to occupy a part of the contemplated new Flat street building."

The Sanford Light and Water Company has been organized at Sanford, Me., for the purpose of furnishing electric lights and water-power in the town named. The officers are: Mr. E. M. Goodall, president, and Mr. George H. Nowell, treasurer. These gentlemen, together with Messrs. B. F. Hayden and H. Hodgson, comprise the board of directors.

The Edison Station No. 2, now being erected on Bowker street, Boston, is rapidly approaching completion. The side walls are up to the second story, the brick chimney is fifteen feet higher, and the excavations for the foundations of the engines and boilers are finished. Mr. Edgar, general superintendent of the Edison central station in Boston, reports that it is expected that station No. 2 will be in running order about Dec. 1. The underground system in connection with station No. 2 is more than half finished, and it is believed that within the next 30 days this also will be completed.

Station No. 2 will start up with a lighting capacity of 2,500 incandescent lights of 16 candle-power. The foundations, however, are being built for an equipment capable of furnishing 12,000 lights. Armington & Sims engines and Heine patent safety boilers, set with Jarvis furnaces, will be used. The Jarvis Engineering Company have the contract for fitting up the entire steam plant.

The Saturday evening (Oct. 8) edition of the Boston *Herald* contained the following: An adjourned meeting of the committee on electric lights at Hyde Park was held last evening in the selectmen's rooms, with Mr. O. T. Gray in the chair. The contract was prepared, and awaits the signature of the officers of the American Electric Manufacturing Company. It calls for 75 double arc lights of actual 2,000 candle-power each, at an annual cost of $70 per light, for a term of three years. Any additional lights must be furnished at the same price and under same conditions. A letter was received from the managers of the above company in reply to the committee's request that the words "actual 2,000 candle-power" be used in the contract in place of the words commonly known as 2,000 candle-power, in which the company agrees to furnish the highest number of electrical units used for a 2,000 candle-power. The committee then adjourned for one week to await the signing of the contract. A number of the members of the committee expressed the opinion that the contract would not be signed, as they do not believe that any electric light company can afford to give an actual 2,000 candle-power light for the price named.

The Newton, Mass., Aldermen, on the evening of Oct. 3, granted permission to the Cambridge Railroad Company to run its electrical cars to the Newton terminus.

The electric car made for the West End Railroad Company, and which was shipped from New York to Boston a few days ago, made its first trial trip since its arrival on Saturday evening, Oct. 8. The car was run at various speeds over the tracks of the Cambridge Railroad from the Cambridgeport stables through Main street and Northern avenue to Porter's station, Cambridge, returning via Harvard square to the starting point. The distance traveled over by the car was about eight miles. The Sprague motor and Julien storage batteries, together with all the apparatus constituting the electrical equipment of the car, worked smoothly and satisfactorily, and the car was stopped and started on the curves and grades along the route without difficulty. Among the gentlemen present at this private experimental trip were Messrs. Geo. B. Prescott, Jr., Lieut. S. Dana Greene, Edward Blake, Fredk. J. Sawyer, Wm. J. Hammer, and A. H. Chadbourne. It is proposed to give another experimental trip in a day or two, and the public will be invited to inspect the car and view it in operation.

Much interest is taken by people of Boston in regard to the result of the combination of the Western Union and Baltimore & Ohio telegraph companies, so far as the public is concerned. It is thought that some offices may be closed and a slight advance made in rates, but the representatives of the two companies in this city say that they have received no official information whatever in regard to the probable action of the companies.

A short time ago the operator at the Baltimore & Ohio Telegraph office at Stoughton, Mass., received notice that that office would soon be discontinued. When the lines were put through the village at Stoughton the company was compelled by the selectmen to sign an agreement that, in consideration of leave to to place poles in the highways, an office should be established there permanently. The selectmen called the attention of the company to this agreement and received notice this morning that the office will be maintained as heretofore.

The Boston *Daily Globe*, Oct. 8, gave its readers a few pointers on telegraph in the following manner:

"It is now believed that the next object of Western Union will be the Commercial Cable Company and Postal and United Lines, all owned by people willing to sell, but differing somewhat on the price. Mr. Mackay is understood to have expressed a desire to sell, and, although nothing certain is known, it is believed that Mr. Gould has the privilege of taking both the cable and land lines at the prices specified. Messrs. L. M. Barlow and Edward Lauterbach are the lawyers representing Mr. Mackay and the United Lines people, and from what is known of their methods they will be very likely to remove every obstruction in the way."

Mr. and Mrs. George Washington Adams invited a large number of relatives and friends to be present at their beautiful residence on Grampian Way, Savin Hill, Dorchester, Mass., on the evening of Oct. 8. The occasion was the twenty-fifth anniversary of the marriage of Mr. and Mrs. Adams, and the invited guests heartily and happily entered into the celebration of the silver wedding of the estimable couple. The gathering was a large and joyous one, and among it were many prominent citizens of Boston and vicinity and several of the guests, old friends of "Happy,"

had traveled hundreds of miles to be present. The house was brilliantly illuminated, and across the spacious lawn in front were hung Chinese and Japanese lanterns. Mr. and Mrs. Adams were the recipients of a large number of beautiful and costly presents, among which were noticed the following: A handsome silver service from members of the "Cyclone Jim Fishing Club," of which Mr. Adams is commodore, bearing the following inscription: "To 'Happy,' from a few Cyclones;" a set of coffee spoons, from Fuller, Holtzer & Co.; a silver pitcher and cup, from the Boston Electric Club, accompanied by a letter of congratulation from the members; a beautiful champagne set of Satsuma glass, from members of the New York Electric Club; a costly berry dish, from Mr. and Mrs. A. K. Holly, of Brooklyn, N. Y., who were present at the marriage of Mr. and Mrs. Adams; an exquisite crystal dish, from Mr. and Mrs. A. B. Tenney; a crystal basket, from James F. Hill; a crystal dish, from M. J. Kiley; a beautiful coffee pitcher, from Henry A. Pingree; silver salver, from Mr. and Mrs. C. H. Porter; a beautiful and novel cigar case, from Mr. and Mrs. L. P. Pollard. Many beautiful presents were received from other friends, and numerous letters of congratulation were received from all over the country.

The firm of Bergmann & Company, of New York, some time ago established a branch house in Boston, located at the station of the Edison Electric Illuminating Company, Head place, just off Boylston street. From the outset the agency has been a success, and through it the artistic chandeliers and combination fixtures for incandescent electric lights, as manufactured by Bergmann & Company, have become better known and more extensively used in New England than ever before. Mr. W. C. Livermore is the New England manager, and makes his office at the Boston address given above.

The Pratt & Whitney Co., Hartford, Conn., have commenced the erection of a four story brick building, 100×75 feet, across the street from their factory. It will be built with large timbers after plans approved by mill insurance men, and will be used for storage purposes only. W. I. B.

PHILADELPHIA NOTES.

PHILADELPHIA, Pa., Oct. 10, 1887.

The announcement in the dispatches from New York last Thursday that the Western Union had purchased the Baltimore & Ohio telegraph lines, paying therefor the sum of $5,000,000, created quite a sensation in this city, although the deal had been anticipated for some time. The news had hardly spread throughout the city before City Councils, both branches of which were in session at the time of its receipt, took official notice of the matter by the unanimous adoption by both bodies of the following preamble and resolution:

"*Whereas*, The Baltimore and Ohio Telegraph Company is announced as having consolidated with the Western Union Telegraph Company, by sale or purchase, and the said Western Union Telegraph Company being a competing line within the State of Pennsylvania and other States, therefore, be it

"*Resolved*, By the Select and Common Councils of the city of Philadelphia, That the City Solicitor, in conjunction with the Chief of the Electrical Bureau and the Joint Law Committee of these Councils, shall inquire into the matter, and, on due proof of such consolidation, sale or merger, shall immediately and forthwith order and direct the Department of Public Safety to take possession of the poles, wires and fixtures of said company now erected on certain streets within the limits of the city of Philadelphia, and that the City Solicitor be authorized to collect the amount of the bond given by said Baltimore and Ohio Telegraph Company, in accordance with the provisions of the ordinance of these Councils, approved the twenty-first day of March, 1883, and pay the sum so forfeited into the City Treasury."

The bond given by the Baltimore & Ohio Company, and which was one of the conditions under which it was permitted to enter the city with its wires, is for $50,000, and suit will probably be brought within a few days to recover the amount, which will go into the general fund of the city treasury. The State law on the subject of merging or consolidating telegraph or railroad lines is very stringent, and, upon proof of a consolidation, sale, lease or merger of one company with a competing line, authorizes the Attorney-General to begin proceedings to have the merged lines escheated to the State. In view of this law, and the general public sentiment in the matter, it is highly probable that some action will be taken by the State authorities toward enforcing the law as soon as the fact of the transfer becomes officially known.

The B. & O. have for some time past been reducing expenses with a vengeance, and, as a result, many of their best employés ave either secured other positions or are on the lookout for something else. Every one was included in the cut, which averaged about 20 per cent., and all are smarting under the influence f the policy of retrenchment. An old operator, who has been in he company's employ for a long time, said the other day: "It looks like adding insult to injury to reward years of faithful service by taking $15 off of a servant's monthly pay and in addition to impose other hardships in the matter of hours, etc. I cannot help believing that the whole scheme was one to anger the men to such a degree that they would leave the service of their wn volition and thus relieve the Western Union of the necessity of discharging the surplus of operators and other employés which would exist when they came into possession of the B. & O. plant. If this was the intention, it has succeeded to some extent, but some of us will remain simply through spite, even though we are compelled to suffer temporarily."

Councils' Committee on Electrical Department last week referred to a sub-committee an ordinance allowing the Morse Underground Company to lay conduits on the west side of Delaware avenue, between Walnut and Market streets.

Councilman A. Ellwood Jones intimated that the Morse Company was in the hands of speculators who obtained privileges in order to borrow stocks. President Mercheng, of the company, said that the concern was in different hands now. He was personally interested in his patents and wanted to see them succeed. The capital stock of the company was $2,500,000, and the stock was valued at $5 per share. His company had paid $50 into the treasury for printing the ordinance. Mr. McMurray said that he company had deceived the public and he read an ordinance repealing several ordinances of the company because their printing bills had not been paid.

Similar action was taken on ordinances extending the time of the American Telephone and Telegraph Company from three to five years in which to complete the contract, and granting privileges to the Edison and Keystone electric light companies.

The Electrical Committee also resolved to report negatively the bill to authorize the Department of Public Safety to permit the National Automatic Fire Alarm Company, of Philadelphia, to connect its instruments and apparatus with the Electrical Bureau.

The recent cable dispatches from London which state that advices have been received by the English Government that the Viceroy Li of China has withdrawn from the arrangements made with the Wharton Barker syndicate through Count Mitkiewicz, owing to the energetic protests of the treaty powers, but more particularly Germany and England, and that Mr. Barker had been notified by cable on Tuesday by the Viceroy of his inability to carry out the provisions of his agreement entered into with Count Mitkiewicz, and of the peremptory termination of all negotiation between the syndicate and the Chinese Government, are emphatically denied by Mr. Wharton Barker.

Mr. Barker has received no notice of the dispatch which it is reported has been sent to the United States Government to the above effect, and states that he has written to the State Department to inquire into the truth of the assertion. He is now awaiting a reply to his letter to Secretary Bayard.

In an interview Mr. Barker said that "the Imperial Chinese concessions for the Chinese-American bank and for the telephone were placed in his hands immediately on the arrival here of S. P. Makiet Chang, the special imperial envoy sent to America to discuss and complete the business in detail.

"These concessions having been accepted at the time, and having not only the signature and seal of Viceroy Li Hung Chang as Prime Minister of China, but also the signature of three other Chinese officials, the Chinese Government cannot recede from the position taken July 23 and July 26, 1887, without giving him and his associates cause for indemnity of loss that would follow nonfulfillment of these contracts."

Mr. Barker said "the public had better know now that these concessions grant a perpetual charter for a Chinese and American bank, with a capital of 25,000,000 Shanghai taels, with power to increase that capital to 50,000,000 taels without further grant from the Chinese government. The bank, in addition to the usual functions of a bank, has the right to coin and issue gold and silver money, the government very properly retaining the right to fix size, weight and standard.

"The profit on this branch of the business is to be divided into two equal parts, one to go to the government and one to the bank. The bank has the right to undertake the building of railroads and other public works that may be authorized by the Chinese government.

"In addition to profit in building the railroads and other public works the bank would have a very substantial permanent interest in them all.

"The opposition to this enterprise had its centre in England and Germany, and from the time it was known what the Prime Minister had granted on behalf of the imperial government the representatives of those nations, political and commercial, have brought every possible adverse pressure upon the Chinese government at Pekin.

"Mr. S. P. Makiet Chang, having heard the report that the Chinese government had revoked the agreement, sent a cable to China last evening in which he said that, having completed the negotiations, he could not undo what he had done. It should be clearly understood that Mr. Makiet Chang has received no other advice from his government than to complete the negotiations with all possible dispatch."

Mr. Barker said that Count Mitkiewicz had been simply a negotiator in this undertaking; that Mr. Simon A. Stern, of this city, was his immediate and responsible representative in China, and that Mr. Stern alone signed papers for him. These facts were well known in China.

Mr. Barker said the concessions are to him; and with him and the gentlemen who are his associates rests the whole business. Should there be any truth in the reports published in London and New York recently, Mr. Barker said that he and his associates expect and will demand the support of the government of the United States. E.

WESTERN NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
CHICAGO, Oct. 8, 1887.

The following editorial is clipped from the *Tribune* of this city and refers to the proposed tax upon telephone instruments: "Alderman Hamline's ordinance, introduced in the Council Monday night, to regulate the laying of telephone wires ought to be passed. Its purpose is avowedly to compel the telephone companies to pay a tax on each instrument. An ordinance directly providing for such a tax was introduced last summer, but was withdrawn on the recommendation of the Law Department that it would be held invalid by the courts. Alderman Hamline, who is a keen lawyer, has taxed his legal ingenuity in drafting the present one so as to render it proof against every legal objection that the attorneys for the monopolies may raise. The tax is to be imposed in lieu of rent for the use of the streets. Alderman Kerr, who is also an able lawyer, seems to agree with Alderman Hamline as to the validity of the new ordinance. It ought to be given a chance at any rate. The fee fixed is moderate. The telephone companies can well afford to pay $10 for each instrument. There is good precedent for the tax on the ground of the use of the streets by the corporation. It was upon this ground that the $50 tax per car was imposed on the street railroad companies. Those corporations protested strongly for some time, but finally agreed to pay. They found it cheaper and easier in the end. The telephone companies probably had enough experience of the expense of fighting legislation in Springfield last summer to avoid any attempt to fight municipal legislation such as is proposed by the ordinance referred to. Success in defeating a moderate tax now may result in bringing on a more onerous tax in the future. Ald. Hamline should push his ordinance with all possible vigor."

The Okonite Company, of New York, have appointed the Central Electric Company Western agents for the sale of their well-known wires. The Central Electric Company have already won a well-deserved popularity as a supply house, their trade having grown so large as to necessitate increased space for warerooms. They have also recently added a manufacturing and repair department, equipped with modern machinery.

The Electrical Construction Company, of this city, have wired the cannons at the Military Encampment so that they can be discharged together. The arrangement is used in a piece of music by the military band.

During the visit of President Cleveland to this city the triumphal arch, near the Palmer House, was beautifully lit with incandescent lamps.

The Chicago, Burlington & Quincy Railroad are always first to adopt improvements which will increase the efficiency and comfort of their patrons. Messrs. Johnson, Holland & Co. recently wired one of their new suburban cars with twenty lamps, eighteen inside the coach and one upon the outside at each end for lighting the platforms. The lamps inside were arranged upon the sides of the roof of the car near the lower edge of the arch. The outside lamps were protected by wire screens. The batteries were placed in two separate boxes underneath, fifteen cells in each box, and sideways to the car. The switch box was placed in the toilet room, and the circuits are so arranged that either or both sides could be put in or out of circuit at will, or all the lamps thrown in multiple arc, giving one-half candle-power each.

The assistant superintendent, Mr. Howland, accompanied Mr. Johnson and the WORLD representative upon the trial trip of about twenty miles and expressed himself highly pleased at the result. The expressions of satisfaction by the passengers were numerous and the number of people reading was particularly noticeable. Such enterprise cannot fail to increase the popularity of this road. It is very safe to predict that within the next few years every railroad coach will be lit by electricity and the unsightly bell cord be replaced by the push button.

The Chicago Electric Club met last Monday evening, with President Stiles in the chair. The treasurer, Mr. F. S. Terry, read his report of receipts and expenditures. The committee appointed at the previous meeting reported that they had engaged rooms at 124 South Clark street. Over five hundred dollars was then subscribed for furnishing the rooms. It is designed to keep the rooms open at all times, so that members can entertain friends and visitors. Mr. J. L. Barclay read a paper upon the "Distribution of Power," outlining the many advantages to be obtained by the use of motors.

The paper became the subject for the evening's discussion. Mr. Barclay displayed a keen realization of the possibilities of the motor, and its pecuniary side was well advanced. A vote of thanks was tendered Mr. Barclay. Mr. E. P. Warner, who was announced to read a paper upon the "Automatic Regulation of Currents," was unavoidably absent. It is expected that Mr. Warner will favor the club at its next meeting.

There has been trouble for some time between the Commissioners of the Insane Asylum at Yankton, Dak., and the Governor of the territory, which culminated when the commissioners ordered an electric light plant. For this action they were told to resign on the ground of extravagant management. The latest advices are that the commissioners refuse to resign, and the issue will be whether the order of the electric light for the Yankton Insane Asylum is an extravagant proceeding or not.

The Detroit *Free Press* devotes nearly a column to the death of Mr. Hiram Corliss, an employé of the Brush Electric Light Company of that city, who was killed while repairing tower wires. The body hung across the wires for some time before being noticed, and further time elapsed before the hook and ladder company arrived and took the body down. During all this time hundreds of citizens viewed the body. Dr. McKinlock was called, and did all in his power to resuscitate and revive Mr. Corliss, but without avail. Hypodermic injections of whisky and ammonia were tried, when he showed signs of life but did not speak. He died a few seconds after, if indeed he was not already dead before the doctors reached him. Mr. Leggett, president of the Brush Company, states that Mr. Corliss probably ascended the pole for the purpose of making a test, but he could not say in what manner he received the current. Mr. Corliss was in the employ of the Brush Company for years, and was hard working and industrious.

Mr. J. W. Phillips, vice-president of the Kansas City Electric Light Company, committed suicide last week. No cause is assigned.

Mr. Wetmore, of the Okonite Company, and Mr. Ackerman, of the American Electrical Works, were in the city this week.

Mr. W. F. Davidson, the Michigan agent of the Thomson-Houston Company, took orders in two days recently for plants amounting to over $22,000, including two fifty-light machines, one thirty and one twenty-five, with lamps. During the week closing to-day he has also, I hear, closed contracts for three alternating plants of 650 lights each. He has three plants in course of construction, using the Thomson-Houston system—Sault Ste. Marie, Hillsdale and West Bay City.

The following is a special dispatch from Cleveland of Oct. 1. I have not ventured to condense it: On the Beeksville road, about six miles from the town of Loraine, O., lives a farmer by the name of Max Harman, who came from Pennsylvania about a year ago. Harman's family consists of a wife and three children. The oldest, named Mary, is a young lady nineteen years of age, who has passed through one of the strangest and most painful experiences which ever fell to the lot of a human being. A short time ago she was a plump, rosy-cheeked girl, in robust health and of a sunny disposition. To-day, through the influence of a most peculiar accident, she is in all but years a shrunken, peevish old woman. The story of this strange metamorphosis is as follows:

Mary was engaged to be married to a man named Jacob Ebertin, who worked for Mr. Harman, and made his home with the family. About six weeks ago the young couple came to Cleveland to make some purchases and see the sights. One of the young man's friends worked in one of the electric light establishments at the time. Ebertin proposed to take his future bride through the place and show her the machinery. It appears that a broken wire of her panier, or bustle, had unperceived worked its way through her dress. While passing along the wire came in contact with one of the powerful electric machines, and her hand, resting on an iron bar at the time, completed the circuit and she received a severe shock and fell insensible to the floor. In a few moments

she revived sufficiently to be removed from the place, and was taken to her home. Medical aid was summoned, and for four days the girl lay in bed in a paralyzed condition. Then she regained the use of her limbs, but immediately began to lose flesh rapidly; the hair on the left side of her head turned gray and began falling out. After four weeks Miss Harman was able to be about, but in that time she had been transformed from a young, handsome girl into a feeble old woman. Her form, which had been plump and rounded, was thin and bent, and the skin on her face and body was dry and wrinkled. She had been a sweet tempered, affectionate girl, but is now peevish, irritable and selfish. Her voice is harsh and cracked, and no one to look at her would imagine that she was less than sixty years of age. The Harman family are horrified and well-nigh heart-broken by the fate of their once handsome daughter, while young Ebertin is almost frantic over the change in his affianced bride. The physicians claim that the electric current communicated directly with the principal nerves of the spine and left side of the head, and that the shock almost completely destroyed their vitality. Instances in which a person's hair has turned white in a single night from fright, grief or some excessive nervous shock are not rare, but this is supposed to be the first case in medical history in which a person has been known to step from the bloom of vigorous youth into the decrepitude of old age within a week.

Col. S. G. Lynch, broker, 146 La Salle street, Chicago, furnishes me with the following quotations upon telephone stock:

	C. H. M.
Bell of Mo.	$155@$157
Central Union	44@ 45
Chicago	385@ 400
Colorado	18@ 20
Cumberland	80@ 85
Great Southern	28@ 30
Iowa Union	25@ 27
Michigan	72@ 73
Missouri and Kansas	69@ 70
Rocky Mountain Bell	40@ 45
Wisconsin	105@ 107

THE TELEGRAPH.

Direct Cable.—The Direct Cable Company has declared a dividend of 2 per cent.

T. M. B. A.—The date of the annual meeting of the Telegraphers' Mutual Benefit Association is Nov. 16, and not Nov. 26, as previously announced.

Newark, O.—An ordinance was recently passed authorizing the Gamewell Company to put in a fire-alarm system, but it is stated that an injunction has been issued to prevent the execution of the work.

The Commercial Cable.—Mr. DeCastro, Mr. Mackay's representative, tells Dow, Jones & Co. that there is absolutely no truth in the statement that Mr. Mackay desires to sell the Commercial Cable Company and Postal and United lines.

Baltimore & Ohio Directors.—At a meeting last week of the New York Baltimore & Ohio Company, the old officers were re-elected as follows: David H. Bates, President; Edward A. Leslie, General Superintendent; Robert Garrett, President of the Baltimore & Ohio Railroad Company; Edward R. Bacon, the counsel of the Telegraph Company, and Edward C. N. Bruce the secretary of President Bates.

Chicago Bucket Shops.—A dispatch of Oct. 7, from Chicago, says: President Wright, of the Board of Trade, struck another blow at the bucket shops to-day. The Commercial Quotation Company, which operates tickers in connection with the Postal Telegraph Company, was denied the privileges and quotations of the Board, and the tickers were stopped. The reason for this action was the belief that the quotation company was aiding bucket shops as against the Board. Mr. Wright has definite and reliable information from Boston that the Commercial Quotation Company had put in tickers there to accommodate bucket shops without any authority. In most cases they were put in where other tickers had been removed at the Board's request. They are now entirely shut off from the Board.

Undesirable Complication.—In quite a number of cities the fire-alarm telegraph system is being encumbered and embarrassed by devices employed for other purposes than sounding fire alarms. It is possible in some places to go to a fire-alarm box in the street, and turn in either an alarm of fire, an ambulance call, or a call for the police. As all these calls are transmitted over the fire-alarm wires they are received in every engine-house, and as a consequence every company has to prepare immediately upon the sound of the gong to run to a fire, whereby much unnecessary labor and wear and tear is imposed upon the fire department. A fire-alarm system should be used for fire alarms only, and when it renders these satisfactorily it is worth far more than its cost to the community. To complicate it with any other calls is to introduce the possibility of mistakes and mis-direction of the fire apparatus in times of need. If the police and ambulance telegraph is necessary, it should be run entirely independently of the fire-alarm system. The simpler the latter can be made, the safer it is.—*Fire and Water.*

A Bargain.—On the basis that the Western Union Company is to issue new stock to pay for the Baltimore & Ohio purchase, some Wall street mathematicians have been figuring out "the exact cost" of the Baltimore & Ohio system to the Western Union. Fifty thousand shares represent 500 certificates of 100 shares each. The engraved plate from which Western Union certificates are printed is in Mr. Gould's possession, and to strike off 500 new certificates will cost—the estimate is from a printer—about 20 cents a piece, or for the lot $100. Mr. Gould, having a large patronage to dispose of, can probably even get a discount from this price; but he might not care to ask favors of vulgar tradesmen; and, anyhow, $100 isn't an excessive price for the whole Baltimore & Ohio telegraph system.—*New York Times.*

On a Tour of Inspection.—The Board of Directors of the Erie Telegraph & Telephone Company, which operates in the States of Arkansas, Texas, Minnesota, and sections of Ohio, also the Territory of Dakota, has been visiting Cleveland, Chicago, St. Paul, Minneapolis, etc., on a tour of inspection of the telephone system, under the guidance of General Manager J. P. McKinstry. The party was composed of Colonel J. W. Bennett, president, a member of Governor Ames' staff, and a resident of Lowell, Mass.; Charles J. Glidden, treasurer, of Lowell; Hon. Francis Jewett, member of the Governor's Council of Massachusetts, residing at Lowell; Charles E. Adams, of Lowell, a member of the House of Representatives of Massachusetts; Charles T. Hood, inventor and owner of Hood's sarsaparilla, of Lowell; J. W. Pickering, of the Pickering Knitting Company, of Lowell; Hon. Levi Sprague, of Lowell; ex-Governor James A. Weston, of New Hampshire; Dr. R. J. Breckenridge, of Austin, Tex.; J. K. Dunbar, general superintendent of the telephone business in Arkansas and Texas, of Austin, Tex.; and the Hon. W. J. McKinnie, of Cleveland.

THE TELEPHONE.

Montreal, Can.—The Federal Telephone Company has been offering to give exchange service in Montreal at the rate of $35 for business offices and $25 for residences. It has a capital stock of $250,000.

Disgruntled Subscribers.—The telephone subscribers of the Cumberland Telephone Company, at Memphis and Nashville, have held meetings to protest against the proposed increase in the rates, already mentioned in these columns; and have given notice of their intention to take out their telephones should the new rate be enforced.

The Brooks System in New York.—With regard to the manner in which water obtained access to the terminals of its Brooks underground system in this city, the Metropolitan Telephone Company states that the water found its way in at the exchange terminals while the pipes were being charged with oil. The company has never had any trouble at all with the outside terminals.

Heavy Forgeries.—A special dispatch from Chicago of Oct. 6 says: Albert J. Whiteman, who acted for years as assistant manager of the Chicago Telephone Company, pleaded guilty of forgery this afternoon and was sentenced to four years in the penitentiary. Whiteman was infatuated with gambling, and his stealings have been continued through a period of over two years The amount taken will reach $18,000. This he secured by a system of forged checks drawn on the Northwestern Bank.

THE ELECTRIC LIGHT.

Daytona, Fla., is likely to have a Brush plant.

Carroll, Ia.—An electric light plant is to be put up in Carroll.

Livermore Falls, N. H.—The new pulp mill is to have an electric light plant.

Hopedale, Mass.—A plant of 30 arcs has been installed in the Hopedale Electric Fabric Company.

Cohoes, N. Y.—The village has given a lighting contract to the Cohoes Electric Light Company.

Antigo, Wis.—An electric light company has been formed at Antigo with a capital stock of $10,000.

Albion, Ore.—An electric light franchise has been granted to C. B. Bellinger, J. Paquet and others.

Maine Mills.—A plant of 75 Loomis incandescents has been put in the Wesserrunsett Woolen Mills, Maine.

Staunton, Va.—The Thomson-Houston Company at Staunton is to add an incandescent machine to its plant.

Sandusky, O.—It has been proposed by the city council to replace all the street gas lamps by electric lights.

Paterson, N. J.—The Paterson Electric Light Company is to do an incandescent business in addition to its arc.

Worthville, N. C.—The J. M. Worth Manufacturing Company have been putting an electric light plant in their factory.

Richmond, Va.—The Fort Wayne Jenney Company has sold a plant of 200 arcs and 1,200 incandescents for Richmond.

Newburgh, N. Y.—The Kilmer Manufacturing Company, of Newburgh, has taken a plant of 250 incandescent lights of the Loomis system.

Sheffield, Ala.—The D. A. Tompkins Company, of Charlotte, N. C., is about to begin work on the new electric light plant.

Salt Lake City.—The new hotel at Salt Lake City, the Cullen Hotel, the finest in Utah, will open this month with an incandescent plant.

San Antonio, Tex.—The electric light contract made by the gas company with the city, for two years, is for fifty arc lights at $14.40 per month.

Berkley, Cal.—The Berkley Electric Light Company has been organized by R. P. Thomas, D. Dowling and others, with a capital stock of $30,000.

East St. Louis, Mo.—The Pike Electric Company, of East St. Louis, has been formed by E. W. Pike, S. B. Pike and N. O. Gray, with a capital stock of $25,000.

East Berkley, Cal.—The East Berkley Electric Light Company has been organized by C. K. Clark, W. P. Moore and others, with a capital stock of $30,000.

San Francisco.—The California Electric Light Company has met with a favorable reception for its request to be allowed to erect poles larger than those heretofore in use.

Wilmington, Del.—The Wilmington City Electric Light Company has installed a 100 h. p. engine to run the dynamo for the city's arc lights and to generate current for the electric railway.

Atlanta, Ga.—The Co. Pen Hill Land Company has been incorporated at Atlanta, by S. J. Rill and others, to buy and sell electric light works, gas works, etc., with a capital stock of $75,000.

Baltimore, Md.—The Waterhouse Company, to be incorporated in Baltimore, has interested in it R. R. Zell, of New York, and W. R. Pope and R. Rennert, both of Baltimore. It is also said that the Consumers' Water and Illuminating Company, to supply Woodbury and vicinity, contemplates building an electric light plant.

Meriden, Conn.—The Meriden Gas Company has bought out the Meriden Electric Light Company and united both plants in one, with a capital of $250,000. Mr. G. R. Curtis is president of the new company.

Nashville, Tenn.—The Brush Electric Light and Power Company, of Nashville, reports a rushing business. The Westinghouse plant is nearly ready to start and a large demand for the light is expected.

Ball Plants.—The Ball Electric Light Company, of Boston, reports the following recent business: National Worsted Mills, Providence, R. I., 90 additional lights; Parker Mills, Fitchburg, 35 lights; Cleghorn Mills, Fitchburg, 35 lights.

Waterville, Me.—The electric light dynamos at Waterville are taxed to their full capacity. One of Waterville's business men, having concluded to put in the coming light, was informed that the company had all the customers it could attend to at present.

New York City.—It has been proposed in the Board of Electrical Control to put down some 23 miles of temporary conduit, to cost about $2,000 per mile, into which the electric light companies with city contracts must run their wires, but the board is not yet agreed upon the subject.

New Albany, Ind.—The Citizens' Electric Light Company which was recently formed, has an American plant of 50 lights. The capital stock is $50,000. Mr. W. S. Culbertson is president, Mr. J. K. Woodward, Jr., secretary and treasurer. The company hopes soon to add to its plant.

Chicago, Ill.—Marshall, Field & Co. have ordered 50 additional lights for their mammoth dry-goods house, increasing the plant from a capacity of 180 to 230 full arc lights of the Western Electric Company's system. The warehouse is said to be by far the best lighted in the city of Chicago.

Catskill, N. Y.—The three trustees of the Catskill Electric Light Company, whose names were given in a recent issue, are also the owners of the Catskill Gas-Works. The electric plant is to be operated in connection with the gas-works. The company proposes to furnish both arc and incandescent light, but has not yet decided as to system.

Oneonta, N. Y.—The Oneonta Electric Light and Power Company has contracted with the Sawen & Conant chair factory to furnish power for the new electric light plant. A new 50 horse-power engine, built expressly for electric light purposes, will therefore be added to the factory in addition to the 250 horse-power engine which is to run the machinery of the factory.

Electric Light Litigation.—The Edison Electric Light Company has brought suit in the United States Circuit Court at New Haven, Conn., against the New Haven Electric Company, operating the Thomson-Houston system. The ground of complaint is infringement of the three-wire patent, No. 274,290, of March 20, 1883, and the "multiple arc distribution" patent, No. 369,280, of Aug. 30, 1887.

Des Moines, Ia.—The Des Moines contract with the Capital City Gas Company expires Jan. 1, 1888, and several electric light companies are after the business of illuminating the city. The Capital City Gas Company proposes to light the business portion of the city with 100 arc lights of 2,000 candle-power each for $12 per light per month, in accordance with the provisions respecting gas-light ordinances.

Wellsville, O.—The Citizens' Electric Light and Power Company, of Wellsville, O., intends putting in a 100-arc light plant from the Waterhouse Company, of Hartford, Conn. The work of installation is now going on, and it is expected that the plant will be ready by November. The Buckeye engine will be used. The company has a paid-up capital of $20,000, and has the following officers: Mr. A. G. Smith, president; Mr. A. G. McKenzie, secretary and treasurer. Mr. E. G. Whitacre, of Whitacre & Co., the large wood turners, etc., is also interested.

Spencer, Mass.—At Spencer, Mass., the gas company is operating two Ball dynamos with three Otto gas engines of an indicated total capacity of 45 h. p. The dynamos are supporting 60 arc lamps, and it is claimed that there is power to spare for 20 more lights. In the average nightly run of 4½ hours, 3,910 cubic feet of gas are consumed. The gas costs the company not to exceed 50 cents per 1,000 feet, so that the power cost of the lamps for the run is only 3½ cents per lamp. The man in charge of station and lamps costs only $15 per week. This is evidently an economical plant to operate, and one that is likely to have many duplicates. The plant is said to give perfect satisfaction to the people of Spencer. It has now been running since the end of July.

Washington, Ind.—The Washington Gas and Electric Light Company write us as follows with regard to the statement that they propose to furnish city arcs at $8 per month: "The company recently contracted with the city to furnish 8 electric lights of 1,700 c. p., 8½ ampères, Waterhouse system, these lights to be run till 2 A. M., when required by the Philadelphia schedule, at $10 per lamp per month; contract for one year. Our company is also contracting to furnish some lights to private consumers till 11 P. M., Sunday excepted, at $8.50 per month. So far, we are well pleased with the Waterhouse system, and have demonstrated, so we declare, to all manufacturers of coal gas, that such system can be successfully operated by an Otto gas engine. We are using a 35 light dynamo, which is run by a 25 h. p. Otto engine made by Schleicher, Schumm & Company, of Philadelphia."

APPLICATIONS OF POWER.

The Field Motor on the Thirty-fourth street branch of the elevated road has been given another trial, and is reported to have run very successfully.

Fulton Street, New York.—The North and East River Railroad Company (Fulton street line, Bentley-Knight conduit system) has obtained permission from the Board of Electrical Control to proceed with the work of laying its conduit.

Chattanooga, Tenn.—The Crest Railway Company, to build a road along the celebrated Mission Ridge, has the option of

using electric motors. D. C. McMillin, J. P. McMillin, R. W. Price, C. J. Dunlap and W. H. Converse are interested.

Philadelphia.—The storage car of the American Electrical Car Company, Wm. Wharton, Jr., president, has been run with marked success on the Chestnut and Walnut street line.

Pittsburgh, Pa.—A largely attended meeting of the stockholders of the St. Clair electric road was held a few days ago. The work on the completed portion of the road was approved and steps taken to begin operations on the Brownsville avenue branch.

Another Electric Boat.—An electric submarine boat has been brought into notice at Havre. It is something over 8 m. in length, 2 m. deep, and of a capacity of 5 tons. The shell is constructed entirely of steel. The motor has been designed by Captain Krebs, of the French Navy, famous for his dirigible balloons, in use now by the Ballooning Corps of the army. Storage batteries are used. The boat has made 6½ knots for five consecutive hours during the public trials.

Pittsburgh, Pa.—A local paper says: "A meeting of East End citizens will be held at the office of J. L. Koethen, to perfect the organization of a company to erect a street railway from Oakland to the Colfax school-house in the twenty-second ward. The road will be three miles in length and the estimated cost of construction is placed at $60,000. This is promised by property holders in the vicinity, who desire a better means of getting into the city. The road will connect at Oakland with the cable road, and will be run either by electricity or dummy engines."

St. Catharines, Ont.—A special dispatch of Oct. 8 from St. Catharines, says: "The St. Catharines street railroad opened six miles of road between this city and Thorold yesterday. It is run by electricity (the Van Depoele system), and proved a perfect success in every particular, far exceeding the expectations of the managers. The electricity is generated by a water-power at lock No. 12, Welland Canal. Overhead conductors are used. The cars are each equipped with a 15 horse-power motor, weighing about 1,600 pounds, which is placed on the front platform. The company expect to have 12 motor cars on within two weeks."

PERSONALS.

Mr. W. Bracken, president of the Julien Electric Company, has returned from Europe.

Mr. H. P. Hungerford, of the Electrical Supply Company, of New York, has returned recently from a visit to Nova Scotia, and other northern regions.

Mr. T. A. Edison has purchased some land near Oroville, in Southern California, and will build a winter home and laboratory there. It is said that Mr. E. T. Gilliland will be his companion in this project.

Mr. Woodhouse, of the well-known firm of Woodhouse & Rawson, Limited, died at Brighton, England, on Sept. 21, after a lingering illness of nearly two years.

Mr. C. J. Glidden, the well-known telephone promoter and capitalist, of Lowell, Mass., has become a member of the large private banking house of Messrs. Cordley & Co., of Boston. Mr. Glidden will, it is understood, retain the treasurership of the Erie Telephone Company.

Mr. W. S. Howell.—The New Brunswick *Home News* has the following: "Mr. W. S. Howell, superintendent of the Edison Electric Light Company, a few days ago tendered his resignation, to take effect Oct. 1. He has three responsible and remunerative positions offered him in large cities as superintendent, but will not decide which to accept until December next. In the meantime he takes a short vacation. Before assuming a permanent position he will go to Williamsport, Pa., where he has been engaged to superintend an electric light plant that is being enlarged. Mr. Howell proved himself an energetic, clear-headed and tireless worker. He organized the splendid system of incandescent lighting now in successful operation in this city, and did it in the face of strong and wealthy opposition. He is a practical man and enthusiastic electrician, and we regret exceedingly that New Brunswick is too small a place for the gratification of his ambition. He will leave the works in first-class condition."

MISCELLANEOUS NOTES.

Franklin Institute Lectures.—As usual, the programme of lectures to be delivered before the Franklin Institute of Philadelphia contains several electrical topics. Prof. W. A. Anthony will lecture Nov. 25 on "Electrical Measurements," especially for commercial purposes; Commander A. D. Brown, U. S. N., Jan. 13, on "The Electric Distribution of Time;" Prof. W. D. Marks, Jan. 20, on "The Duration of Incandescent Electric Lamps;" Mr. Edward Weston, Feb. 18, on "Electro-Metallurgy." Lectures are also promised conditionally by Mr. F. J. Sprague on "The Electric Transmission of Energy," and by Mr. T. A. Edison on "The Pyro-Magnetic Dynamo and Motor."

Chumming for Bass with Electric Lights.—Striped bass are beginning to run up the East and North rivers again. Years ago they were plentiful in these waters, but oil drove them away. Lately there has not been so much oil in the bay, and the fish are coming back. A great place to catch them is off the Battery. Nearly every night half-a-dozen Whitehall boats, each carrying a couple of fishermen, bob up and down on the choppy seas between the Barge Office and Castle Garden. Each man has a couple of hand-lines. The fishermen haul in fair strings of striped bass, averaging from one to three pounds. They say the bright electric lights along the Battery sea-wall attract the fish and hold them there just as menhaden "chum" lures the great South Bay bluefish.

BUSINESS NOTICES.

Jordan & Gottfried, 208 Canal St., N. Y., carry a complete stock of iron and brass machine and wood screws, bolts cap and set screws, taps, dies, files, twist drills, brass and rubber in tubing, rod and sheet copper, brass, German silver, steel and iron wire, shafting, tools, etc.

Page Belting.—The Page Belting Company, of Concord, N. H., are very busy with orders. They manufacture staple goods in both belting and lace leather, which have already attained an excellent reputation, and have secured for the company a large trade. Among their specialties is the new lacing called the "Hercules," made on a new principle, after many years of study and experiment on the part of the company. The demand for the goods is widespread. One late order for belting and lace leather was for the new works of the Northern Pacific Terminal Company at Portland, Ore.

STOCK QUOTATIONS.

The following list, compiled by Mr. W. H. Baker, Broker, 16 and 18 Broad street, gives the current quotations of electrical stocks:

Oct. 10, 1887.

TELEGRAPH.	Bid.	Asked.
Am. Dist.	.....	37
Am. Tel. & Cable	71	74
Cen. & So. Am.	100	110
*Com. Tel	.....	.....
*Gold & Stock	90	97
*Inter. Ocean Tel.	.....	.....
N. Y. Mutual	70	80
Pac. & Atl.	49	56
*Postal T. & C.	30	.....
South. & Atl.	72	80
W. U. Tel.	76¾	76⅞
W. U. Scrip.	.....	.....
W. U. Bonds	118	.....
Mut. U. Bonds	86	87
TELEPHONE.		
Am. Bell	218	219
Am. Speaking	105	115
Erie	33	34
*Hudson River	50	57

TELEPHONE.	Bid.	Asked.
Mexican	¾	1
*N. Y. & N. J.	.....	91
N. Y. & Pa.	.....	.....
New England	40¾	41
*Southern Bell	125	135
ELECTRIC LIGHT.		
*Am. Electric	.....	50
*Brush	.....	51
*Brush Ill.	.....	96
*Consolidated	4	.....
*Daft	.....	.....
*Edison	130	150
*Edison Ill	85	.....
*Edison Isolated	.....	.....
*United States	.....	50
*U. S. Ill.	80	.....
MOTOR.		
*Daft	.....	.....
*Sprague	.....	.....

* These stocks are so seldom dealt in that it is difficult to give prices at which they can be bought or sold. The figures given are as near as can be ascertained.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

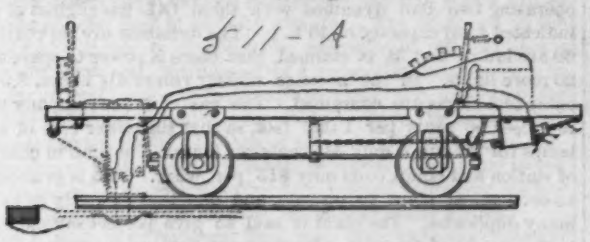
PATENTS DATED OCTOBER 4, 1887.

370,794. Dynamo; W. Lahmeyer, Aachen, Prussia, Germany. Application filed April 14, 1887. The body, cores and base are all cast in one piece.

370,801. Electric Gas Lighter: J. J. McGowen, Ithaca, N. Y. Application filed Feb. 7, 1887. The gas is ignited by means of a wire rendered incandescent by the current which is turned on by the movement of the gas cock.

370,831. Electric Signaling Apparatus; J. P. Tirrell, Boston, Assignor to J. F. Emerson, Wakefield; G. O. Carpenter, Boston, and J. W. Carter, Newton, Mass. Application filed Dec. 27, 1886. A striking mechanism is set in operation to sound a bell or bells, and mechanical devices operated by the striking mechanism to effect the closing of the circuit again set in operation the striking mechanism to sound other bells.

370,847. Resonant Attachment for Telephones; E. A. Balloch, Washington, D. C. Application filed June 7, 1887. Two concentric shells are arranged so as to form an intermediate air chamber, the inner shell having one or more openings in its sides, and having one end covered by a diaphragm.



370,894. Electric Car Brake.

370,851. Fire-Damp Annunciator; A. Berghausen, Elberfeld, Germany. Application filed April 2, 1887. See The Electrical World, page 204, this issue.

370,885. Fire Alarm and Police Telegraph System; A. M. Neeper, Pittsburgh, Pa. Application filed Nov. 27, 1886. By this system, if two signals are sent in simultaneously, they will be recorded in rotation at the central office.

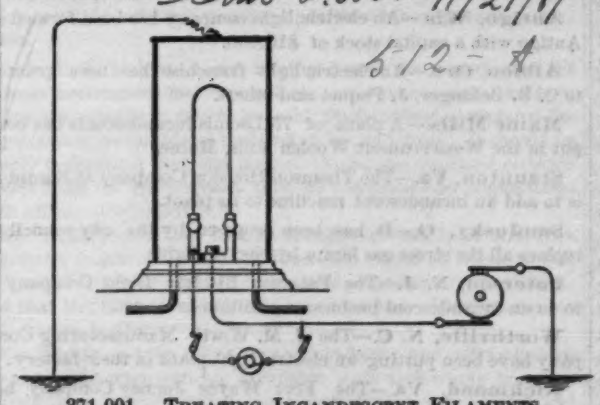
370,894. Electric Car Brake; W. M. Schlesinger, Philadelphia, Pa. Application filed Nov. 19, 1886. The core of the solenoid which operates on the brake levers is mounted on anti-friction rollers to prevent wear of the parts. See illustration.

370,898. Telegraph Receiver; Charles Selden, Baltimore, Md., Assignor to himself, Wm. T. Barnard, of same place and F. Van Rysselberghe, of Brussels, Belgium. Application filed June 15, 1886. Two pendulous magnets susceptible to accentuated electric impulses of short duration in a line circuit, an independent vibratory circuit-breaker controlled by the magnets, and a local circuit controlled by said circuit-breaker. See illustration.

370,917. Railroad Signal; R. D. Anderson, Ethel, La. Application filed March 31, 1887. By the automatic detachment of a clip or catch, a signal of warning is set.

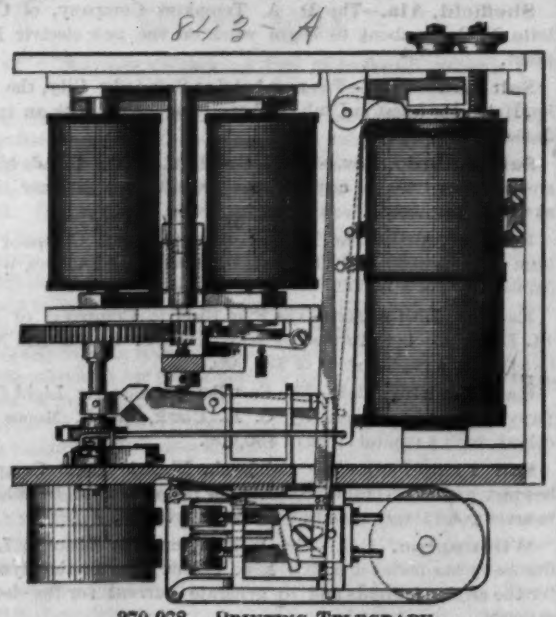
370,932. Electric Alarm Clock; E. J. Colby, Chicago, Ill. Application filed Feb. 23, 1887. An alarm clock having an insulated bell which is brought into circuit by the hammer of the bell striking a contact on the back stroke.

370,955. Subterranean Electric Line System; G. W. Le Vin, Chicago, Ill., Assignor to H. N. May, same place. Application filed Feb. 21, 1887. The invention relates to the construction and operative arrangement of the conduit, manholes, junction boxes, wire distributing devices, cable hauling-through devices, etc.



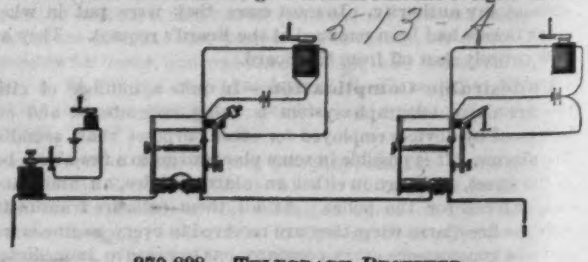
371,001. Treating Incandescent Filaments.

370,978. Printing Telegraph; R. J. Sheehy, New York, N. Y., Assignor to the Independent Printing Telegraph Company, of same place. Application filed Dec. 16, 1885. In this device an electro-motor is used instead of the ordinary heavy driving weights. See illustration.



370,978. Printing Telegraph.

(1) 370,992. Process of Treating Electric Light Filaments; **(2) 370,993. Incandescent Electric Lamp**; **(3) 370,994. Process of Evacuating Globes for Incandescent Electric Lamps**; **(4) 370,995. Process of Manufacturing Filaments for Incandescent Electric Lamps**; **(5) 370,996. Process of Evacuating Globes for Incandescent Electric Lamps**; **(6) 370,997. Method of Evacuating Incandescent Electric Lamps**; **(7) 370,998. Process of Forming Filaments for Incandescent Electric Lamps**; **(8) 370,999. Manufacture of Incandescent Electric Lamps**; **(9) 371,000. Process of Bending Filaments for Incandescent Electric Lamps**; **(10) 371,001. Process of Treating Filaments for Incandescent Electric Lamps**; **(11) 371,00 . same**; **(12) 371,00 . Incandescent Electric Lamp**; Edward P. Thompson, Elizabeth, N. J. Applications filed, respectively, 1 and 2. Sept. 15, 1886; 3, 4, 5, 6, 7, 8 and 9, Feb 22, 1887; 10 and 11, Feb. 4, 1887, and 12, Feb. 28, 1887. 1, 4, 7, 9 and 10. These methods and processes are designed to give strength to the filament; to prevent them throwing off particles of carbon which blacken the globe; to make them longer lived, etc. They consist of modifications of the following: in passing a current of electricity through the filament and heating it to a degree that will cause it to break, the filament being located in an atmosphere of hydro-carbon. See illustration. 2, 8 and 12. A device whereby only a portion of the filament may be included in the circuit to give a small amount of light. Method of widening the loop of filament after it has been inserted, and means for depriving the leading in wires from the occluded oxygen during the evacuation process. 3, 5 and 6. Means for getting high vacua, consisting in first exhausting by ordinary methods, and then causing a series of explosions which will assist in driving out the contained air.



370,898. Telegraph Receiver.

371,111. Conduit for Electrical Distribution; Thomas Wallace, New York, N. Y. Application filed Sept. 25, 1885. An underground system combined with a tower on top of buildings from which aerial wires are distributed to houses in the vicinity.

371,121. Thermostat; W. H. H. Barton, Brockton, Assignor to E. W. Upton and H. G. Rice, Peabody, and H. Torrey, Hanover, Mass. Application filed Aug. 12, 1886. A metallic spring in the form of a circle, with one end free to respond to variations in temperature, acts upon a double pivoted rod which plays in front of a scale with electrical contacts at each end thereof.

371,147. Railway Signal; P. Milroy, of Jerauld County D. T. Application filed May 28, 1885. Station agents are enabled to notify occupants of trains running between stations of the immediate danger from such causes as impending collisions, etc., coming to their knowledge after the trains have left their stations.

Copies of the specifications and drawings complete of any of the patents mentioned in this record—or of any other patents issued since 1866—can be had from this office for 25 cents. Give the date and number of patent desired, and address Johnston's Patent Agency, Potter Building, New York.